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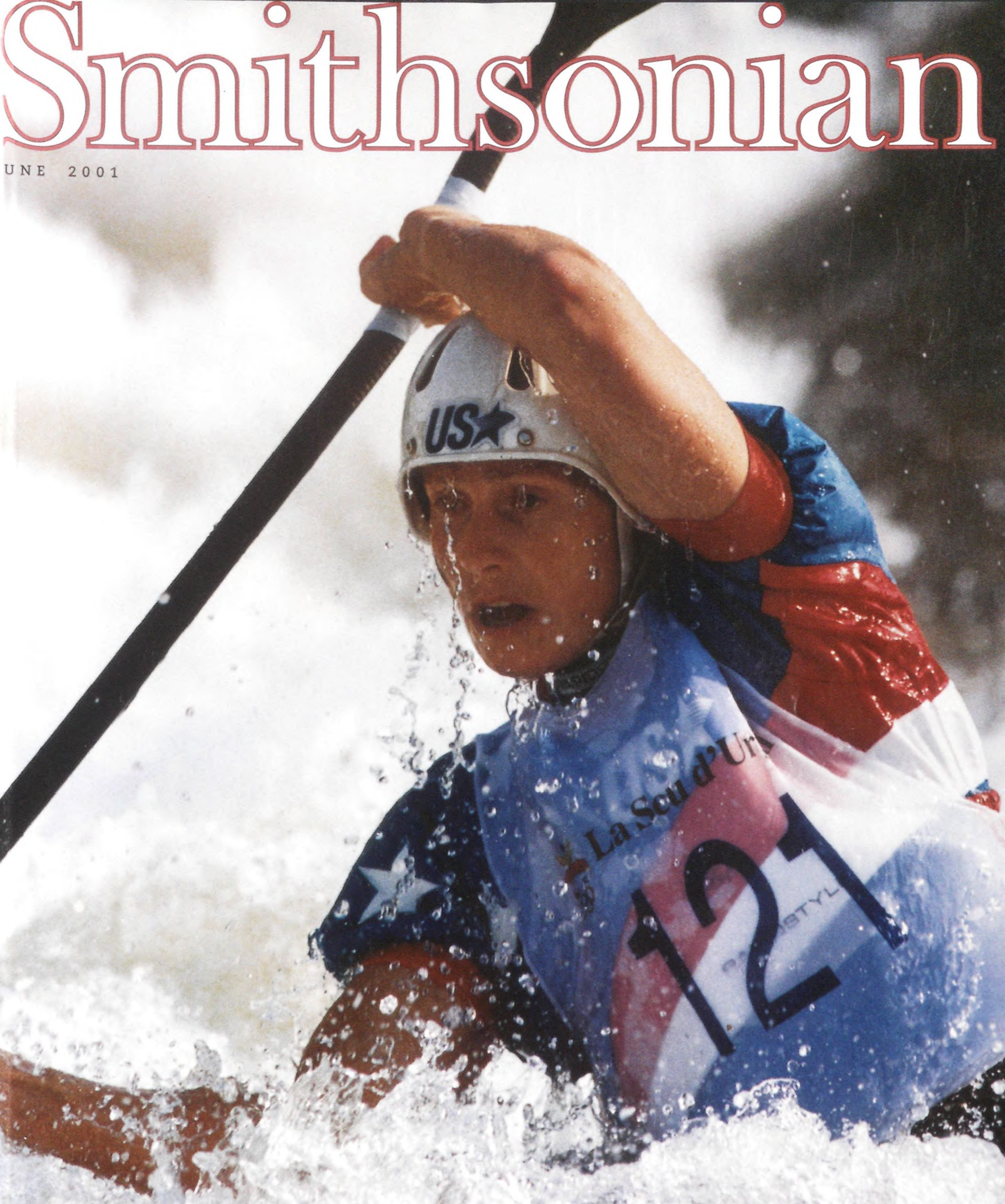

Women Athletes Make a Splash

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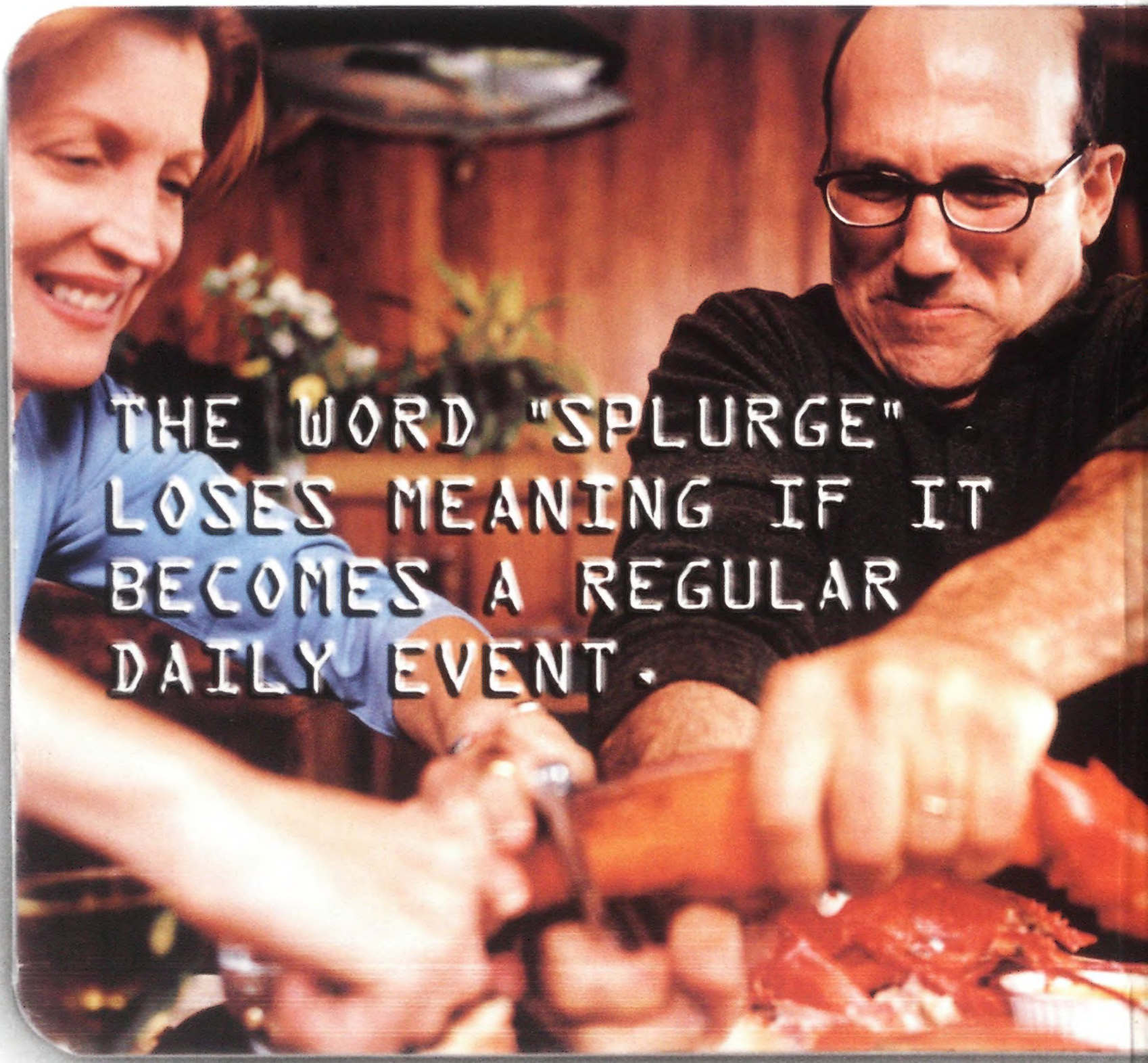

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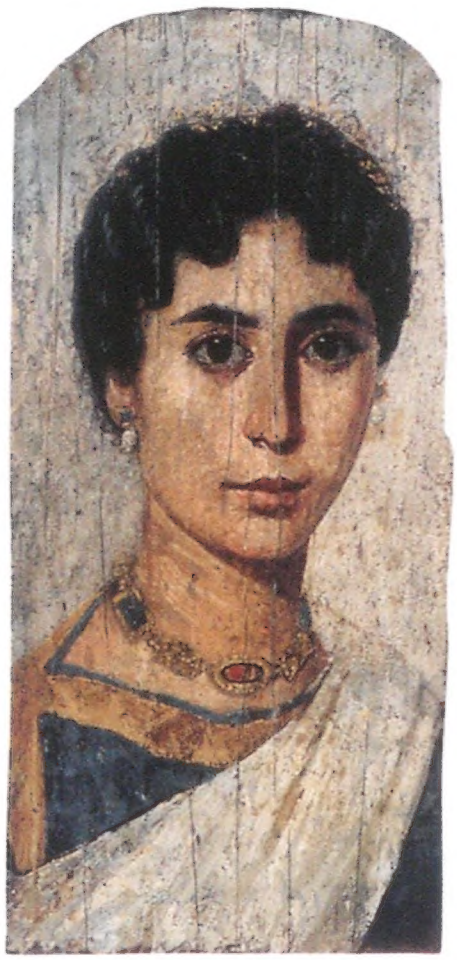

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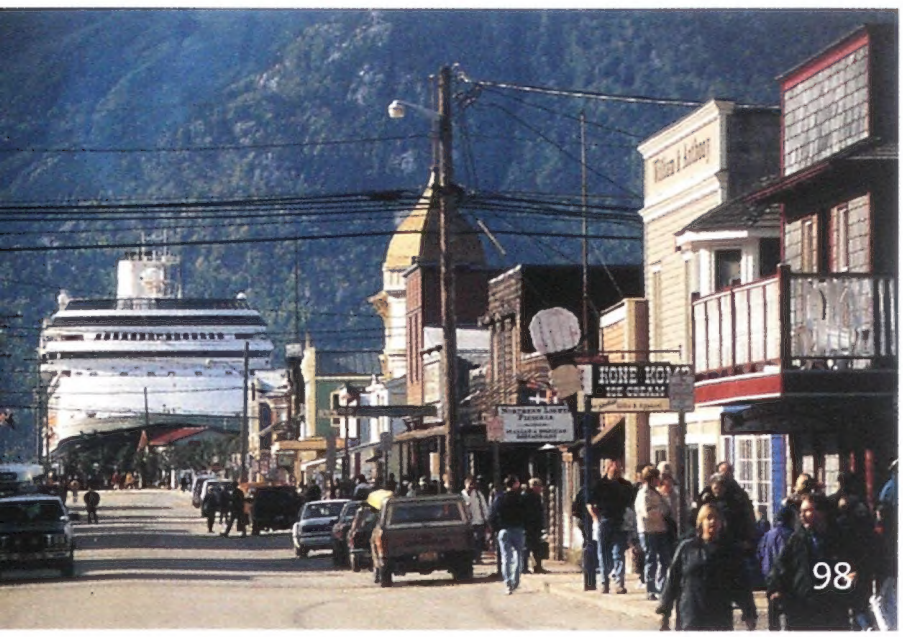

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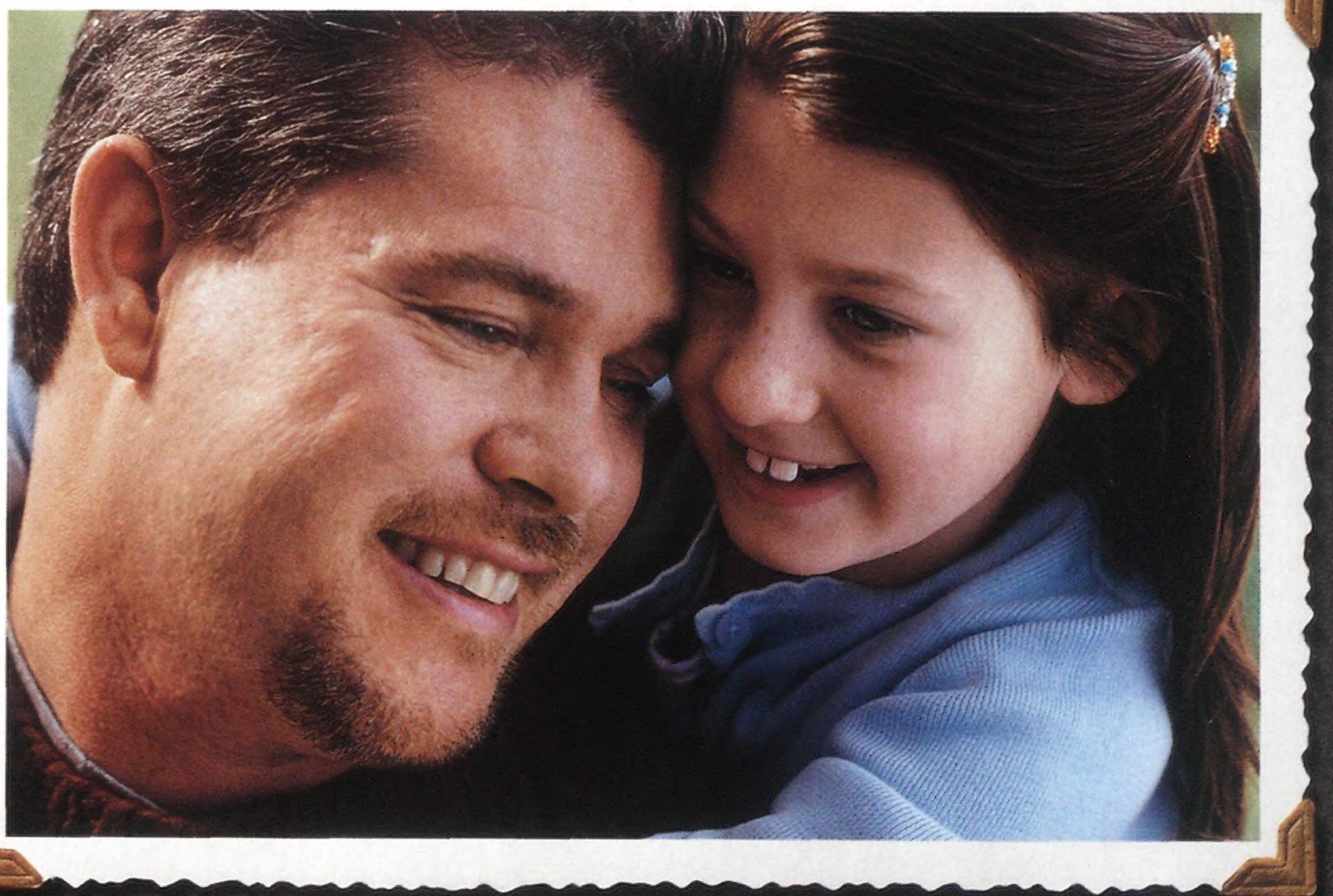

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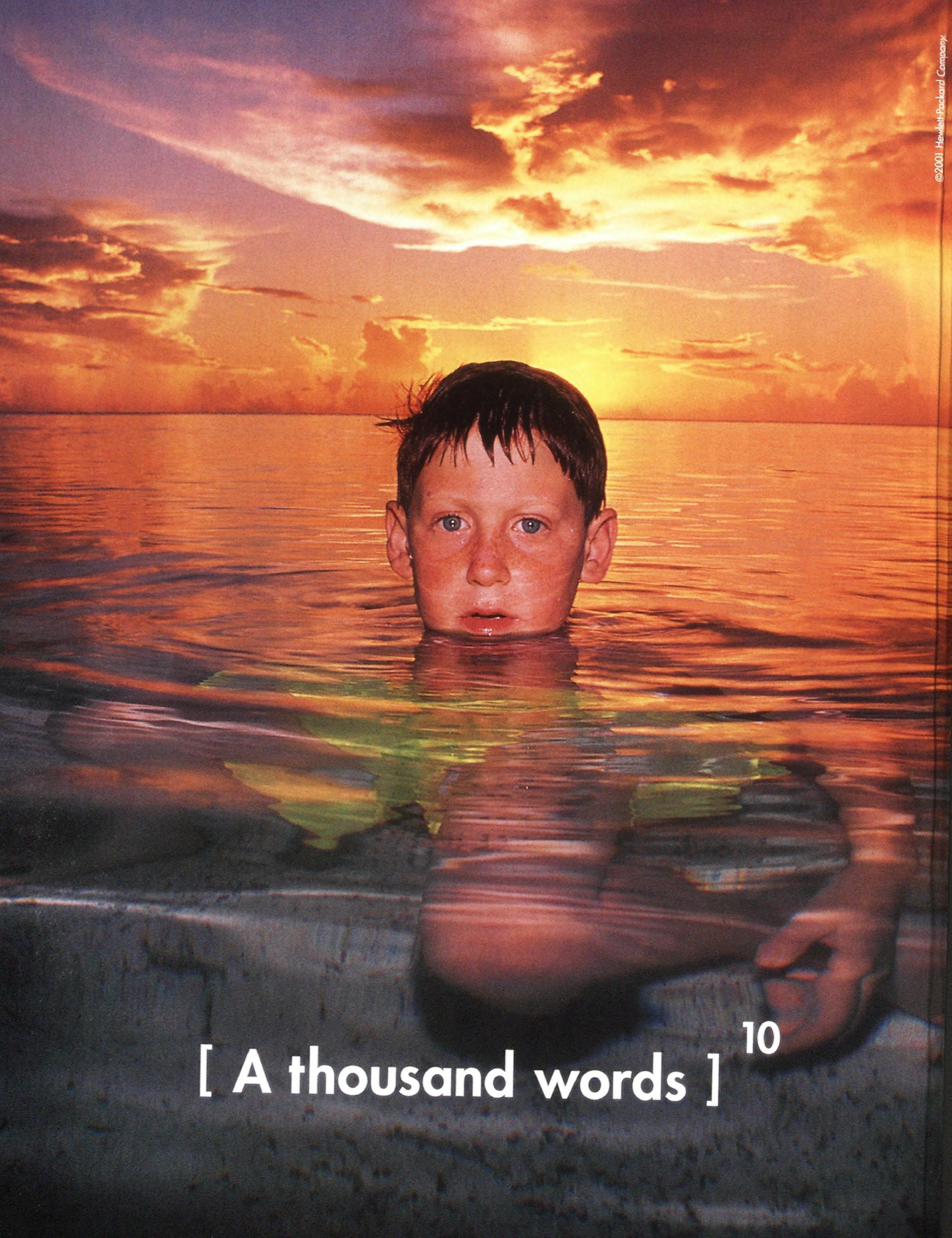
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Cover

Cover Dana Chladek of the U.S. kayaking team paddles her way to a bronze in the women's slalom singles event at the 1992 Barcelona Olympics. (She went on to win silver in the same event at the 1996 Olympics in Atlanta.) Born in Czechoslovakia, Chladek is from a paddling family: her parents were on the Czech national kayaking team, which won the world championship in 1963 and 1965.

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Smithsonian Science

A NOTE FROM THE SECRETARY

ENGLISH SCIENTIST JAMES SMITHSON'S ONLY MANDATE for the Institution that would bear his name was the "increase and diffusion of knowledge," and from the Smithsonian's first days, in 1846, that mandate has been interpreted to include scientific research. The Smithsonian was scientific from the start, as it was throughout all its subsequent years of growth into what is now the world's largest museum and research complex. And science remains at the core of our mission today. But because there now exist so many institutions to conduct scientific research, on a scale and at a cost no one could have imagined in 1846, or even 1946, we must define with great care the contribution a 21st-century Smithsonian can make to the Institution's long tradition of scientific excellence.

From my first days as Secretary, I have strongly and publicly proclaimed my intention to enhance science at the Smithsonian. But how do we best support and enhance science? That is the urgent question we have sought to answer.

We began by gathering the essential factual data about scientific activity at the Smithsonian. What we found was a source of both pride and concern: the range of our scientific inquiry is vast, but our financial resources are far less extensive. Although the Institution is not dependent solely upon federal funds to carry out its scientific mission, most of our scientific research support comes from taxpayer dollars. But even that support has not always kept pace with inflation and cost-of-living pay raises. Moreover, the Smithsonian has attempted to maintain, and even expand, its base of scientific operations each year. As average salaries have increased, however, the number of people on the payroll has necessarily decreased—between 15 and 30 percent in some science departments since 1992.

Although we have received programmatic increases from Congress for our cutting-edge work over the years in, for example, astrophysics, support (in inflation-adjusted dollars) for others of our scientific research programs has not grown overall. We are unequivocally committed to changing that, as we are to maintaining the many excellent scientific programs, in addition to astrophysics, that now flourish at the Smithsonian—in anthropology, tropical biology, marine science, mineral science, systematics (the identification of species) and paleobiology, to name but a few disciplines. We are no less committed to sustaining the National Zoological Park as a world-class center of research in reproductive sciences and conservation biology of endangered species, nutrition, veterinary medicine and pathology, and animal behavioral studies—and as a center, too, for training a new generation of experts in those fields.

The first step toward ensuring the most productive possible environment for science and scientists at the Smithsonian is to structure our approach to meet the scientific agenda of the 21st century. The great questions the world faces today—especially about biodiversity, conservation and global environmental change—will be answered most effectively through multidisciplinary, collaborative approaches. How do we engage the Institution's scientists and great collections and facilities in those vital collaborative enterprises?

Our inquiry led us to conclude that we must do nothing less than chart—for the first time in many years—a strategic new course for science at the Institution and align our human, physical and financial resources in a powerful new array.

If our efforts are to succeed, we must create a structure that enables the scientific endeavors of the Smithsonian to be defined more precisely, carried out more effectively and understood more clearly by donors in both the public and private sectors. We shall continue to work with Congress to explore all options for increased taxpayer support of our scientific research, but such support is likely to grow only gradually. Because the new agenda for science requires that we expand our research support significantly, we shall turn as well to the private sector. Beyond the tax dollars they contribute to the Smithsonian, the American people are extraordinarily generous to the Institution. For the first six months of this fiscal year, we have raised more than $121 million from the private sector, an increase of 134 percent over the same period last year—itself a record year that brought more than $206 million to the Institution!

To introduce far-reaching change at a 155-year-old institution is to invite trepidation, and we will do everything possible to allay the concern. All of us at the Institution share the same goal, which is to extend a record of discovery and innovation that reaches from the ocean depths to the edge of the universe. Working together, we shall add new chapters to the history of that great tradition.

LAWRENCE M. SMALL, SECRETARY

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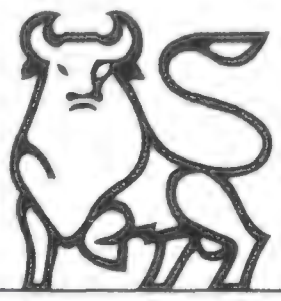

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PANDAS

READING ARTICLES SUCH AS LESLIE Allen's "Return of the Pandas," in the April 2001 issue, always make me think of January 1944. I was a U.S. Air Force radio operator assigned to the airlift operation over the Himalayas between India and China.

An engine fire forced my three fellow crew members and me to bail out over Yunnan Province. My parachute broke my left arm as I hastily exited the plane, making the two-day hike to the city of Likiang even more memorable. We were put up at a mission compound operated by the Reverend Andrews, a kindly British missionary, and his American wife while we waited for a rescue plane. The missionary asked me to sign his guest book, which had had no entries since 1937, and I noticed the name Kermit Roosevelt, a son of President Theodore Roosevelt. The Reverend Andrews explained that Kermit had visited the out-of-the-way place while on a specimen-hunting expedition for a giant panda.

Edward Hilbruner
Springfield, Missouri

Backed by Chicago's Field Museum, Kermit Roosevelt and his brother Theodore Jr. tracked and killed a giant panda in 1929, becoming the first Westerners to do so. Seven years later, Ruth McCombs Harkness, a New York fashion designer and the widow of adventurer William Harkness, brought the first live giant panda to the United States. In 1937 the male cub, misnamed Su Lin, went to live at the Brookfield Zoo in Chicago but died a year later. Harkness wrote the best-selling book *The Lady and The Panda*. In April 1939, China banned the capture of giant pandas. Later this summer, IMAX will be releasing *China: The Panda Adventure*, which is based on the story of Ruth McCombs Harkness. Ed.

WINSTON CHURCHILL

I READ JOHN H. CHETTLE'S ARTICLE "Winston Churchill in America" with interest. My father, Don Nordstrom, was an armored vehicle specialist attached to West Point when the British prime minister visited there after World War II. Churchill asked my Dad to give him "a real tank ride," not the sedate trip reserved for a dignitary. A jolting journey up and down local hills caused Churchill to lose his cane, hat and cigar, and when he exited the tank, he shook hands with my father and said, "Thank you, sir. *That* was a tank ride."

Cherie Nordstrom Braun
Landsdale, Pennsylvania

SHAKERS

COINCIDENTALLY, JUST BEFORE I READ "Living a Tradition" by Richard and Joyce Wolkomir, I had finished the series of Sister Rose Callahan mysteries by Deborah Woodworth that are all centered on 1930s Shaker life. *A Simple Shaker Murder*, *Killing Gifts* and her other novels offer a complete portrait of the Shaker world, its ways and the beliefs of its people, as a compelling homicide draws the reader in.

Donald W. James
Ham Lake, Minnesota

TRAFFIC JAMS

IN YOUR ARTICLE "WE'RE IN A JAM," you wrote, "A traffic jam seems as simple as water moving slower through a constriction." Water, however, moves faster through a constriction. This is the most fundamental principle of mechanics: conservation of mass. For the steady flow of water (an incompressible, continuum substance), the product of velocity and cross-sectional area remains constant. A constriction (reduction in area), therefore, is accompanied by an increase in velocity. Traffic displays the opposite behavior, with a reduction in area (loss of lane) resulting in a decrease in velocity. Application of mechanics to traffic flow is a challenging area of research, complicated by the fact that traffic (that is, people) behaves much more unpredictably than water.

David F. Hill
Civil and Environmental Engineering
Pennsylvania State University
University Park, Pennsylvania

SCIENCE FROM SIX MILES UP

YOUR ARTICLE BY JAMES TREFIL WAS yet another enjoyable take on a great subject. A delightful collection of observations for both physicists and layfolk is *Science from Your Airplane Window* by Elizabeth Woods.

Ken Knowlton
Parsippany, New Jersey

A CAPTION BENEATH A PICTURE OF Ohio landscape was misleading when it spoke of "quarter-mile sections." In surveying, the term "section" refers to a piece of land that is one mile on each side. It is both one square mile and one mile square. Each section contains 640 acres. Most sections were then subdivided into quarter sections of 160 acres. Thus, the expression "lower forty" refers to a quarter of a quarter section.

R. H. Chamberlain
Flournoy, California

WHILE FLYING OVER THE MIDWEST, particularly over Iowa and Illinois, which have squared-off sections that measure one mile, a traveler can estimate the speed of the plane. Watch some part of the plane, let's say the edge of the wing, and as soon as it passes a road, which marks the beginning of a section, look at the second hand of your watch until the wing's edge reaches the next one-mile road. Divide 60 seconds by the number of seconds it takes from one road to the next. For example: if it takes the plane 7 seconds to travel one mile,

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INDICATIONS AND USAGE

Seasonal Allergic Rhinitis

ALLEGRA is indicated for the relief of symptoms associated with seasonal allergic rhinitis in adults and children 6 years of age and older. Symptoms treated effectively were sneezing, rhinorrhea, itchy nose palate/throat, itchy/watery red eyes.

Chronic Idiopathic Urticaria

ALLEGRA is indicated for treatment of uncomplicated skin manifestations of chronic idiopathic urticaria in adults and children 6 years of age and older. It significantly reduces pruritus and the number of wheals.

CONTRAINDICATIONS

ALLEGRA is contraindicated in patients with known hypersensitivity to any of its ingredients.

PRECAUTIONS

Drug Interaction with Erythromycin and Ketoconazole

Fexofenadine hydrochloride has been shown to exhibit minimal (ca 5%) metabolism. However, co-administration of fexofenadine hydrochloride with ketoconazole and erythromycin led to increased plasma levels of fexofenadine hydrochloride. Fexofenadine hydrochloride had no effect on the pharmacokinetics of erythromycin and ketoconazole. In two separate studies, fexofenadine hydrochloride 120 mg twice daily (two times the recommended twice daily dose) was co-administered with erythromycin 500 mg every 8 hours or ketoconazole 400 mg once daily under steady-state conditions to normal, healthy volunteers (n=24, each study). No differences in adverse events or QT intervals were observed when patients were administered fexofenadine hydrochloride alone or in combination with erythromycin or ketoconazole. The findings of these studies are summarized in the following table:

Effects on steady-state fexofenadine hydrochloride pharmacokinetics after 7 days of co-administration with fexofenadine hydrochloride 120 mg every 12 hours (two times the recommended twice daily dose) in normal volunteers (n=24)

Concomitant Drug	*$C_{max ss}$ (Peak plasma concentration)*	*$AUC_{0-t,ss}$ (Extent of systemic exposure)*
Erythromycin (500 mg every 8 hrs)	+82%	+109%
Ketoconazole (400 mg once daily)	+135%	+164%

The changes in plasma levels were within the range of plasma levels achieved in adequate and well-controlled clinical trials.

The mechanism of these interactions has been evaluated in situ and in vivo animal models. These studies showed that ketoconazole or erythromycin co-administration increased fexofenadine gastrointestinal absorption. In vivo animal studies suggest that in addition to increasing absorption, ketoconazole decreases fexofenadine hydrochloride gastrointestinal secretion, while erythromycin may also decrease biliary excretion.

Drug Interactions with Antacids

Administration of 120 mg of fexofenadine hydrochloride (2 x 60 mg capsule) within 15 minutes of an aluminum and magnesium containing antacid (Maalox®) decreased fexofenadine AUC by 41% and C_{max} by 43%. ALLEGRA should not be taken closely in time with aluminum and magnesium containing antacids.

Carcinogenesis, Mutagenesis, Impairment of Fertility

The carcinogenic potential and reproductive toxicity of fexofenadine hydrochloride were assessed using terfenadine studies with adequate fexofenadine hydrochloride exposure (based on plasma area-under-the-concentration vs. time [AUC] values). No evidence of carcinogenicity was observed in an 18-month study in mice and in a 24-month study in rats at oral doses up to 150 mg/kg of terfenadine (which led to fexofenadine exposures that were respectively approximately 3 and 5 times the exposure from the maximum recommended daily oral dose of fexofenadine hydrochloride in adults and children).

In vitro (Bacterial Reverse Mutation, CHO/HGPRT Forward Mutation, and Rat Lymphocyte Chromosomal Aberration assays) and in vivo (Mouse Bone Marrow Micronucleus assay) tests, fexofenadine hydrochloride revealed no evidence of mutagenicity.

In rat fertility studies, dose-related reductions in implants and increases in postimplantation losses were observed at an oral dose of 150 mg/kg of terfenadine (which led to fexofenadine hydrochloride exposures that were approximately 3 times the exposure of the maximum recommended daily oral dose of fexofenadine hydrochloride in adults).

Pregnancy

Teratogenic Effects: Category C. There was no evidence of teratogenicity in rats or rabbits at oral doses of terfenadine up to 300 mg/kg (which led to fexofenadine exposures that were approximately 4 and 31 times, respectively, the exposure from the maximum recommended daily oral dose of fexofenadine in adults). There are no adequate and well controlled studies in pregnant women. Fexofenadine should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Nonteratogenic Effects. Dose-related decreases in pup weight gain and survival were observed in rats exposed to an oral dose of 150 mg/kg of terfenadine (approximately 3 times the maximum recommended daily oral dose of fexofenadine hydrochloride in adults based on comparison of fexofenadine hydrochloride AUCs).

Nursing Mothers

There are no adequate and well-controlled studies in women during lactation. Because many drugs are excreted in human milk, caution should be exercised when fexofenadine hydrochloride is administered to a nursing woman.

Pediatric Use

The recommended dose in patients 6 to 11 years of age is based on cross-study comparison of the pharmacokinetics of ALLEGRA in adults and pediatric patients and on the safety profile of fexofenadine hydrochloride in both adult and pediatric patients at doses equal to or higher than the recommended doses.

The safety of ALLEGRA tablets at a dose of 30 mg twice daily has been demonstrated in 438 pediatric patients 6 to 11 years of age in two placebo-controlled 2-week seasonal allergic rhinitis trials. The safety of ALLEGRA for the treatment of chronic idiopathic urticaria in patients 6 to 11 years of age is based on cross-study comparison of the pharmacokinetics of ALLEGRA in adult and pediatric patients and on the safety profile of fexofenadine in both adult and pediatric patients at doses equal to or higher than the recommended dose.

The effectiveness of ALLEGRA for the treatment of seasonal allergic rhinitis in patients 6 to 11 years of age was demonstrated in one trial (n=411) in which ALLEGRA tablets 30 mg twice daily significantly reduced total symptom scores compared to placebo, along with extrapolation of demonstrated efficacy in patients ages 12 years and above, and the pharmacokinetic comparisons in adults and children. The effectiveness of ALLEGRA for the treatment of chronic idiopathic urticaria in patients 6 to 11 years of age is based on an extrapolation of the demonstrated efficacy of ALLEGRA in adults with this condition and the likelihood that the disease course, pathophysiology and the drug's effect are substantially similar in children to that of adult patients.

The safety and effectiveness of ALLEGRA in pediatric patients under 6 years of age have not been established.

Geriatric Use

Clinical studies of ALLEGRA tablets and capsules did not include sufficient numbers of subjects aged 65 years and over to determine whether this population responds differently from younger patients. Other reported clinical experience has not identified differences in responses between the geriatric and younger patients. This drug is known to be substantially excreted by the kidney, and the risk of toxic reactions to this drug may be greater in patients with impaired renal function. Because elderly patients are more likely to have decreased renal function, care should be taken in dose selection, and may be useful to monitor renal function. (See CLINICAL PHARMACOLOGY)

ADVERSE REACTIONS

Seasonal Allergic Rhinitis

Adults. In placebo-controlled seasonal allergic rhinitis clinical trials in patients 12 years of age and older, which included 2461 patients receiving fexofenadine hydrochloride capsules at doses of 20 mg to 240 mg twice daily, adverse events were similar in fexofenadine hydrochloride and placebo-treated patients. All adverse events that were reported by greater than 1% of patients who received the recommended daily dose of fexofenadine hydrochloride (60 mg capsules twice daily), and that were more common with fexofenadine hydrochloride than placebo, are listed in Table 1.

In a placebo-controlled clinical study, in the United States, which included 570 patients aged 12 years and older receiving fexofenadine hydrochloride tablets at doses of 120 or 180 mg once daily, adverse events were similar in fexofenadine hydrochloride and placebo-treated patients. Table 1 also lists adverse experiences that were reported by greater than 2% of patients treated with fexofenadine hydrochloride tablets at doses of 180 mg once daily and that were more common with fexofenadine hydrochloride than placebo. The incidence of adverse events, including drowsiness, was not dose-related and was similar across subgroups defined by age, gender, and race.

Table 1
Adverse experiences in patients ages 12 years and older reported in placebo-controlled seasonal allergic rhinitis clinical trials in the United States
Twice daily dosing with fexofenadine capsules at rates of greater than 1%

Adverse experience	*Fexofenadine 60 mg Twice Daily n=679*	*Placebo n=679*
Upper respiratory tract infection	2.5%	1.8%
Nausea	1.6%	1.0%
Dysmenorrhea	1.5%	1.0%
Drowsiness	1.3%	0.9%
Dyspepsia	1.3%	1.0%
Fatigue	1.3%	0.9%

Once daily dosing with fexofenadine hydrochloride tablets at rates of greater than 2%

Adverse experience	*Fexofenadine 180 mg once daily n=283*	*Placebo n=283*
Headache	10.6%	10.2%
Upper Respiratory Tract Infection	3.2%	2.5%
Back Pain	2.5%	1.4%

The frequency and magnitude of laboratory abnormalities were similar in fexofenadine hydrochloride and placebo-treated patients.

Pediatric. Table 2 lists adverse experiences in patients aged 6 to 11 years of age which were reported by greater than 2% of patients treated with fexofenadine hydrochloride tablets at a dose of 30 mg twice daily, in placebo-controlled seasonal allergic rhinitis studies in the United States and Canada that were more common with fexofenadine hydrochloride than placebo.

Table 2
Adverse experiences reported in placebo-controlled seasonal allergic rhinitis studies in pediatric patients ages 6 to 11 in the United States and Canada at rates of greater than 2%

Adverse experience	*Fexofenadine 30 mg twice daily n=209*	*Placebo n=229*
Headache	7.2%	6.6%
Accidental Injury	2.9%	1.3%
Coughing	3.8%	1.3%
Fever	2.4%	0.9%
Pain	2.4%	0.4%
Otitis Media	2.4%	0.0%
Upper Respiratory Tract Infection	4.3%	1.7%

Chronic Idiopathic Urticaria

Adverse events reported by patients 12 years of age and older in placebo-controlled chronic idiopathic urticaria studies were similar to those reported in placebo-controlled seasonal allergic rhinitis studies. In placebo-controlled chronic idiopathic urticaria clinical trials, which included 726 patients 12 years of age and older receiving fexofenadine hydrochloride tablets at doses of 20 to 240 mg twice daily, adverse events were similar in fexofenadine hydrochloride and placebo-treated patients. Table 3 lists adverse experiences in patients aged 12 years and older which were reported by greater than 2% of patients treated with fexofenadine hydrochloride 60 mg tablets twice daily in controlled clinical studies in the United States and Canada and that were more common with fexofenadine hydrochloride than placebo. The safety of fexofenadine hydrochloride in the treatment of chronic idiopathic urticaria in pediatric patients 6 to 11 years of age is based on the safety profile of fexofenadine hydrochloride in adults and adolescent patients at doses equal to or higher than the recommended dose (see Pediatric Use).

Table 3
Adverse experiences reported in patients 12 years and older in placebo-controlled chronic idiopathic urticaria studies in the United States and Canada at rates of greater than 2%

Adverse experience	*Fexofenadine 60 mg twice daily n=176*	*Placebo (n=176)*
Back Pain	2.2%	1.1%
Sinusitis	2.2%	1.1%
Dizziness	2.2%	0.6%
Drowsiness	2.2%	0.0%

Events that have been reported during controlled clinical trials involving seasonal allergic rhinitis and chronic idiopathic urticaria patients with incidences less than 1% and similar to placebo and have been rarely reported during postmarketing surveillance include: insomnia, nervousness, and sleep disorders or paroniria. In rare cases, rash, urticaria, pruritus and hypersensitivity reactions with manifestations such as angioedema, chest tightness, dyspnea, flushing and systemic anaphylaxis have been reported.

OVERDOSAGE

Reports of fexofenadine hydrochloride overdose have been infrequent and contained limited information. However, dizziness, drowsiness, and dry mouth have been reported. Single doses of fexofenadine hydrochloride up to 800 mg (six normal volunteers at this dose level), and doses up to 690 mg twice daily for 1 month (three normal volunteers at this dose level) or 240 mg once daily for 1 year (234 normal volunteers at this dose level) were administered without the development of clinically significant adverse events as compared to placebo.

In the event of overdose, consider standard measures to remove any unabsorbed drug. Symptomatic and supportive treatment is recommended.

Hemodialysis did not effectively remove fexofenadine hydrochloride from blood (1.7% removed) following terfenadine administration.

No deaths occurred at oral doses of fexofenadine hydrochloride up to 5000 mg/kg in mice (110 times the maximum recommended daily oral dose in adults and 200 times the maximum recommended daily oral dose in children based on mg/m²) and up to 5000 mg/kg in rats (230 times the maximum recommended daily oral dose in adults and 400 times the maximum recommended daily oral dose in children based on mg/m²). Additionally, no clinical signs of toxicity or gross pathological findings were observed. In dogs, no evidence of toxicity was observed at oral doses up to 2000 mg/kg (300 times the maximum recommended daily oral dose in adults and 530 times the maximum recommended daily oral dose in children based on mg/m²).

Prescribing Information as of November 2000

Aventis Pharmaceuticals Inc.
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US Patents 4,254,129, 5,375,693, 5,578,610

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divide 60 seconds by 7. The plane would be traveling a little less than 9 miles per minute. Then multiply 9 times 60 (minutes in an hour). Your speed is about 540 miles per hour.

Hal Woods

Chicago, Illinois

H.G. WELLS

FOR THE RECORD, HOWARD KOCH adapted H. G. Wells' novel *The War of the Worlds* into the script that Orson Welles directed for radio. Mr. Koch's script was no flash in the pan: he also wrote the screenplays for such films as *The Sea Hawk* and *Mission to Moscow*, and he cowrote the screenplays for *Sergeant York* and *Casablanca*.

I once helped defend the validity of Mr. Koch's copyright in the radio script he wrote, and I had the honor of seeing firsthand the grace with which he handled having been blacklisted because of *Mission to Moscow*.

Michael Trittipo

Minneapolis, Minnesota

AROUND THE MALL AND BEYOND

I LOVE YOUR MAGAZINE, AND I REALize that it is impossible to satisfy every taste all the time, but I read your column "Minding the 'Milkstone'" and found it goofy beyond description. I never realized that dumping rice on tin plates was artistic. What a gift Wolfgang Laib has—move over Michaelangelo. You should have ended the text with two words: April fool.

Harry Perkins

Summerfield, Florida

WRITE TO SMITHSONIAN

Letters for consideration in this column must include your daytime telephone number, full name and postal address. Letters may be edited for clarity and length. **Our new address is Smithsonian Letters Editor, P.O. Box 50383, Washington, D.C. 20091-0383.** Send e-mail to LettersEd@simag.si.edu.

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POINTS OF INTEREST

In Good Spirits

LILY DALE, NEW YORK, IS A CURIOUS LITTLE VILLAGE WHERE THE STILL-QUICK COMMUNE WITH THE ONCE-QUICK

BY BIL GILBERT

Spiritualists gather on the porch of one of the first Victorian cottages erected in Lily Dale, which began in the 1870s as a summer colony.

I'VE LONG WANTED TO SPEND SOME time in a town called Lily Dale, and recently I did. It's an otherworldly community of some 250 more or less permanent residents situated above Cassadaga Lake, 60 miles south of Buffalo, New York. Most true Lily Daleans live in gingerbread Victorian cottages standing haphazardly along a maze of narrow, rough lanes laid out in the 19th century for horse-drawn carriages. The village is overshadowed by groves of century-old oaks, maples and hemlocks, under which proliferate a rich variety of mosses, ferns and fungi. A fairy-tale ambiance pervades the place, something a bit fey and toadstoolish, which is perfectly in keeping with what Lily Dale is all about.

Each summer, thousands of Spiritualists come here to consult with mediums who profess to be in communication with the immaterial remains of the once-quick and who will, for a fee, bring messages from those spirits to the still-quick. Some 30 mediums hung their shingles outside Lily Dale cottages last summer to advertise their services. All had been certified as competent and upright by the Lily Dale Assembly, the governing body of the community, which claims to be the "World's Largest Center for the Science, Philosophy and Religion of Spiritualism."

A belief that spirits can affect mortal affairs is ancient, and a component of many religions. By the mid 1850s, there were more than a million professing Spiritualists in the United States and nearly 70 of their newspa-

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pers. Countless Spiritualist study groups (often calling themselves societies of freethinkers) and churches were established. There were liturgical differences among them, but the basic tenet of this faith was, and remains, that there is an afterlife in which individuals are changed from corporeal to spiritual beings but retain their identities and some of their former, mortal interests.

In 1871 a group of Spiritualists, who later organized as the Lily Dale Assembly, began holding summer meetings on the shores of Cassadaga Lake. Eventually they built some 200 cottages there as well as a sprawling hotel (now the Maplewood), auditoriums, outdoor amphitheaters and picnic pavilions, all of which are still being used. Its facilities and general open-mindedness made the village a haven for iconoclastic thinkers and activists. Susan B. Anthony, the grande dame of the women's suffrage movement, made the first of her several public appearances in Lily Dale in 1891. That day she spoke to an audience of 3,000 people in an amphitheater decorated with flags.

From their beginnings, American Spiritualist groups have been strongly reformist, supporting women's rights, abolition and temperance. Currently, the Lily Dale Assembly, a nonprofit religious corporation, owns all the land within the village. Long-term leases are given to residents, who own their cottages outright and can sell or rent them only to other Spiritualists. An annual maintenance assessment is levied on residents, and summer visitors pay an entrance fee at the community's gate.

Today, the quiet streets of Lily Dale are home to only 250 year-round residents, but during the summer months they're thronged with 25,000 visitors seeking enlightenment.

Inside, a fascinating smorgasbord of uplifting lectures and demonstrations is offered—different ones by different visiting speakers each day. The program-givers sell tickets and split the receipts with the assembly. Broadly, the topics are New Ageish; the visiting savants are not required to be practicing Spiritualists. Last summer, visitors could learn about Past-Life Regression, the Venus Mars Cycle, Angelic Messages, Universal Peace Shield of Truths, Expanding your Mediumship with Vince and John, Therapeutic Touch (at Lily Dale laying hands on clients is permitted but rubbing is not) and Reiki I and II, said to be a Tibetan study of transcendental and transformational energy.

Because their faith emphasizes the power of free will, Spiritualists object to "fortune-telling." Therefore, crystal ballers, palm- and tea-leaf readers and such cannot practice in Lily Dale. Otherwise, so long as they are law abiding, metaphysical rappers of all persuasions are welcomed. "Remember, we started out as freethinkers," Susan Glasier told me, "and we still are." Glasier is a member of the Assembly board of directors and the village manager.

The main continuing attraction and economic backbone of Lily Dale is the cadre of full-time mediums who live there. To practice in the village, they must have professional credentials that satisfy the Assembly and buy an annual business license. They can set their own rates, with $35 to $50 for a half-hour session, or "reading," being about average.

After I talked to a number of people who had been read, it seemed to me that for most it had been a novel experience, but one that left them largely skeptical about having received messages from genuine spirits. However, nearly all had found

Back in the 1920s and '30s, this road sign was posted not far from town on Route 60.

WAYNE SORCE (2)

Mutual Fund Investing: Feeling #5

Curiosity

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The laying on of hands takes place during a service at the Healing Center. Touching the head and shoulders is believed to be a way to channel divine energy for healing.

the reading entertaining, at least in a magic-show way, and were a bit curious about some of the things the medium had told them.

As a daily community service, local mediums volunteer to give short group readings. The one my wife, Ann, and I went to with about a dozen others was conducted by an articulate, businesslike young woman who told us to relax and open our minds. After studying the group intently, she began with a tall, somewhat overweight man who looked to be about 50 years old.

She asked if he had played any sports. He said he had. She asked if an older man, a relative or family friend, had been an athletic mentor. The man said he had an uncle who fitted that description. The medium saw a *J* in his name, which she said might have been Jim. The man said his uncle had been John. The medium said that John was comfortable in the afterworld, as he had not been during his last months here. He advised his nephew to improve his diet and exercise regularly but not so strenuously as he had before.

Then, after studying me briefly but making no comment, the medium turned to Ann, whom she said she saw as a little girl in a farm kitchen with a churn. Ann replied that she had as a child sometimes visited an aunt in Iowa who lived on a farm and owned an electric cream separator. The medium said, "Ah, so." Without giving a spiritual source, she counseled Ann that once she made up her mind she should not let others change it. Ann followed the medium's advice that very evening, in regard to choosing a restaurant.

Later Ann went off to have a private reading with another medium. She was given some general, horoscope-type information, and a message that her mother was happy because her dentures no longer hurt as they had in this life. Ann told me, but not the medium, that her mother only had a removable bridge and it never seemed to bother her.

Meanwhile, I spent some time with Ronald Skowronski, a retired medium and former pastor in Rochester, New York, of the Plymouth Spiritualist Church, which is known as the "Mother Church of Modern Spiritualism." When we met, he was employed as the manager of the Maplewood Hotel in Lily Dale. Skowronski told me he feels Spiritualism is the most comforting of religions because it holds that death is only a transformation from the material to the spiritual world, communication between the two is possible and there is no hell or damnation. He also thinks it is the most open to fraud. "Unquestionably it has attracted con artists who prey on vulnerable people," he said. He believes, however, that self-delusion is far more common than outright fraud. Some mediums are such true believers that they confuse messages that originate in their own minds with those that come from the spiritual world.

The issue that concerns Skowronski is not the authenticity of most messages delivered by mediums but the possibility that people will be overawed by them. "Aunt Martha says you should move to Chicago. That is her opinion and not necessarily your fate. To go or not to go is your choice. Being a spirit doesn't make Martha all knowing or mean she can't be wrong."

So why get in touch with her?

"Spirits probably have a wider perspective than we do and she may give good counsel. But for me it is mostly that I like knowing the old girl is there and we will meet again."

Medium Barbara Sanson counsels clients in an office that exudes cheerfulness.

For people with type 2 diabetes

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Also, blood tests to check for serious liver problems should be conducted before and during *Avandia* therapy. Tell your doctor if you have liver disease, or if you experience unexplained tiredness, stomach problems, dark urine or yellowing of the skin while taking *Avandia*.

See important patient information on the following page.

If you are nursing, pregnant or thinking about becoming pregnant, or if you are a premenopausal woman who is not ovulating, talk to your doctor before taking *Avandia*.

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How does *Avandia* treat type 2 diabetes?
If you have type 2 diabetes, your body probably still produces insulin but it is not able to use the insulin efficiently. Insulin is needed to allow sugar to be carried from the bloodstream into many cells of the body for energy. If insulin is not being used correctly, sugar does not enter the cells very well and builds up in the blood. If not controlled, the high blood sugar level can lead to serious medical problems, including kidney damage, blindness and amputation.

Avandia helps your body use insulin by making the cells more sensitive to insulin so that the sugar can enter the cell.

How quickly will *Avandia* begin to work?
Avandia begins to reduce blood sugar levels within 2 weeks. However, since *Avandia* works to address an important underlying cause of type 2 diabetes, insulin resistance, it may take 8 to 12 weeks to see the full effect. If you do not respond adequately to your starting dose of *Avandia*, your physician may increase your daily dose to improve your blood sugar control.

How should I take *Avandia*?
Your doctor may tell you to take *Avandia* once a day or twice a day (in the morning and evening). It can be taken with or without meals. Food does not affect how *Avandia* works. To help you remember to take *Avandia*, you may want to take it at the same time every day.

What if I miss a dose?
If your doctor has prescribed *Avandia* for use once a day:

- As soon as you remember your missed dose, take one tablet anytime during the day.
- If you forget and go a whole day without taking a dose, don't try to make it up by adding another dose on the following day. Forget about the missed dose and simply follow your normal schedule.

If your doctor has prescribed *Avandia* for use twice a day:

- As soon as you remember the missed dose, take one tablet.
- Take the next dose at the normal time on the same day.
- Don't try to make up a missed dose from the day before.
- You should never take three doses on any single day in order to make up for a missed dose the day before.

Do I need to test my blood for sugar while using *Avandia*?
Yes, you should follow your doctor's instructions about your at-home testing schedule.

Does *Avandia* cure type 2 diabetes?
Currently there is no cure for diabetes. The only way to avoid the effects of the disease is to maintain good blood sugar control by following your doctor's advice for diet, exercise, weight control, and medication. *Avandia*, alone or in combination with other antidiabetic drugs (i.e., sulfonylureas or metformin), may improve these other efforts by helping your body make better use of the insulin it already produces.

Can I take *Avandia* with other medications?
Avandia has been taken safely by people using other medications, including other antidiabetic medications, birth control pills, warfarin (a blood thinner), Zantac® (ranitidine, an antiulcer product from GlaxoSmithKline), certain heart medications, and some cholesterol-lowering products. You should discuss with your doctor the most appropriate plan for you. If you are taking prescription or over-the-counter products for your diabetes or for conditions other than diabetes, be sure to tell your doctor. Sometimes a patient who is taking two antidiabetic medications each day can become irritable, lightheaded or excessively tired. Tell your doctor if this occurs; your blood sugar levels may be dropping too low, and the dose of your medication may need to be reduced.

What should I discuss with my doctor before taking *Avandia*?
In some people, *Avandia* may cause fluid retention or swelling. This could lead to or worsen congestive heart failure, particularly in people taking insulin. So talk to your doctor if you have a history of heart failure or swelling. You should also talk to your doctor if you have liver problems, or if you are nursing, pregnant or thinking of becoming pregnant. If you are a premenopausal woman who is not ovulating, you should know that *Avandia* therapy may result in the resumption of ovulation, which may increase your chances of becoming pregnant. Therefore, you may need to consider birth control options.

What are the possible side effects of *Avandia*?
Avandia was generally well tolerated in clinical trials. The most common side effects reported by people taking *Avandia* were upper respiratory infection and headache. As with most other diabetes medications, you may experience an increase in weight. You may also experience edema (swelling) and/or anemia. If you experience any swelling of your extremities (e.g., legs, ankles) or tiredness, notify your doctor. Talk to your doctor immediately if you experience edema, shortness of breath, an unusually rapid increase in weight, or other symptoms of heart failure.

Who should not use *Avandia*?
You should not take *Avandia* if you are in the later stages of heart failure. The following people should also not take *Avandia*: People with type 1 diabetes, people who experienced yellowing of the skin with Rezulin® (troglitazone, Parke-Davis), people who are allergic to *Avandia* or any of its components and people with diabetic ketoacidosis.

Why are laboratory tests recommended?
Your doctor may conduct blood tests to measure your blood sugar control. Blood tests to check for serious liver problems should be conducted before starting *Avandia*, every 2 months during the first year, and periodically thereafter.

It is important that you call your doctor immediately if you experience unexplained symptoms of nausea, vomiting, stomach pain, tiredness, anorexia, dark urine, or yellowing of the skin.

How should I store *Avandia*?
Avandia should be stored at room temperature in a child-proof container out of the reach of children. Store *Avandia* in its original container.

GlaxoSmithKline

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THE OBJECT AT HAND

Painted Ladies in Space

HIGH SCHOOLERS ASK: WOULD METAMORPHOSIS ABOARD A SPACE SHUTTLE MISSION YIELD NORMAL BUTTERFLIES?

BY JULIE WAKEFIELD

An exhibit at the National Air and Space Museum displays three of the painted lady butterflies that emerged during a flight aboard a July 1999 space shuttle mission.

OF ALL THE GRAVITY-DEFYING wings displayed at the Smithsonian's National Air and Space Museum, the prettiest were forged by nature in outer space. Tiny when compared with the spread of the pioneering Wright brothers' plane or the globe-circling *Voyager*, they emerged in orbit, and belong to a trio of diminutive painted lady butterflies.

Now perched in the "Where Next, Columbus?" gallery, which explores the potential for human travel to Mars, the first butterflies in space provided the final data points of a student-run experiment that flew aboard the space shuttle *Columbia*'s STS-93 mission in July 1999. They symbolize a renaissance of interest in microgravity research as we enter the era of the International Space Station.

Gravity keeps the Moon, the shuttle and the space station in orbit around Earth, and—despite loose talk of "zero gravity"—still exists during the weightlessness of spaceflight. In fact, gravity's pull at the altitude typical of shuttle orbits is about 90 percent that on Earth's surface. But an object in orbit travels at such speeds as to negate almost all of this tug by sustaining a free fall—not toward Earth but around it. Such a condition of persistent microgravity is nearly impossible to reproduce anywhere within the planet's atmosphere.

So, from the Skylab program of the 1970s to the Russian Mir Space Station (which recently plunged into the South Pacific), to the International Space Station now being deployed—and on many of the shuttle flights in between—scientists have taken advantage of these orbiting microgravity laboratories, extending the privilege even to a group of high school students studying butterflies.

The butterflies' incredible migration began in the fall of 1997 in a classroom in Albany, Georgia. There, a team from Dougherty County's high schools—composed of 15 students from a program designed to encourage youth with learning or physical disabilities toward careers in science and technology—set out to determine if a lack of gravity would

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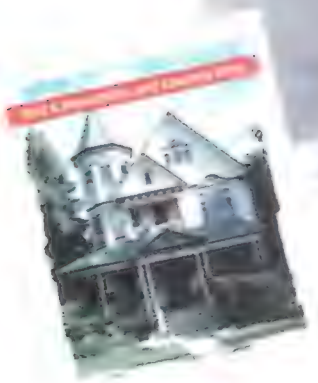

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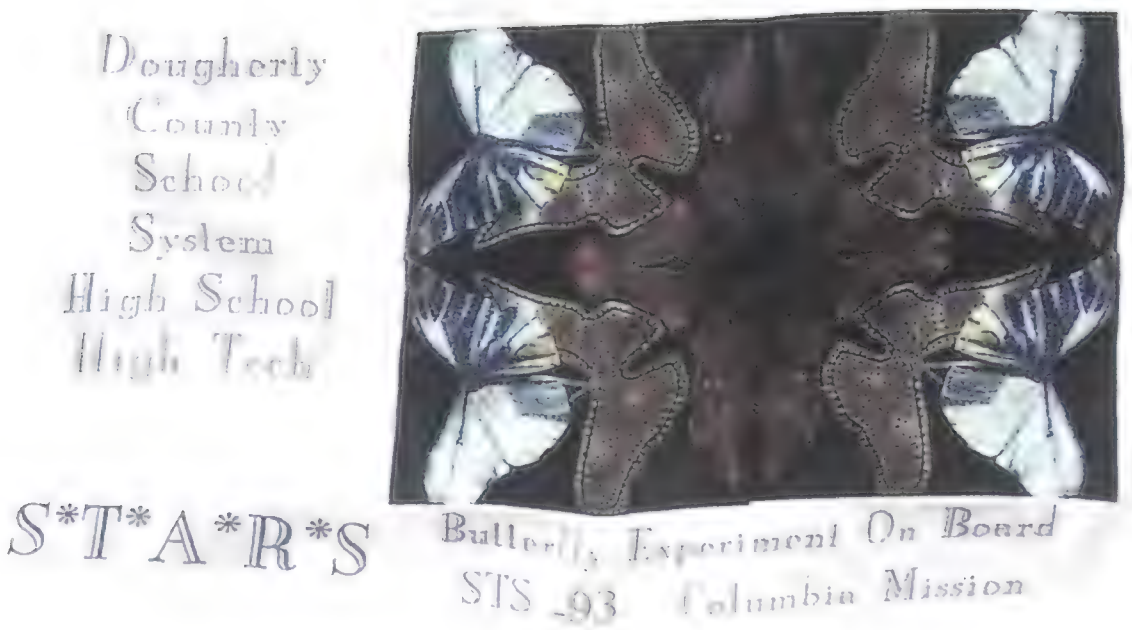

Julie Blackburn, a Georgia high school student, participated in the metamorphosis-in-space experiment and contributed to the design of this banner.

affect metamorphosis. Might Kafkaesque supernormal bugs result? Would shape or colors change or wings be stunted or weak? Would the caterpillars, which normally climb upward and use gravity to build their cocoons downward, be disoriented and unable to adapt?

Aided by area scientists and dedicated teachers, the pupils designed over the course of a year a very compact experiment to monitor five painted lady caterpillars and five cocoons of varying ages. The flight itself would last five days. Assuming the role of payload specialists, students such as Leon Douglas and Julie Blackburn took the critters home at night to better understand metamorphosis, and to iron out details of the experimental design.

Spending time with both the creatures and their container allowed students to notice something that otherwise might have been missed: that the alignment of the screws and holes in at least one place in the Lexan holding box allowed caterpillars to escape. The students also figured out how to anchor the cocoons within the box: a steel crossbar, treated with a sticky substance, to which the cocoons could be affixed. Technicians made the necessary changes, and the experiment went forward.

Although an amateur event, the pressure was big league. The young Georgians were overseeing one of two premiere experiments in a program called S*T*A*R*S, or Space Technology and Research Students. The program was started by SPACEHAB, Inc., a Houston, Texas-based company that builds, owns and operates the reusable pressurized modules that fit in the shuttle cargo bay. The double module used on the shuttle houses up to 10,000 pounds' worth of microgravity and life science experiments per flight, including the student projects. While other student experiments have been launched into orbit, the S*T*A*R*S program takes advantage of the Internet by "Webcasting" nearly real-time images of the experiments to the student-researchers—and countless other students at schools around the world.

Might Kafkaesque supernormal bugs result? Would shape or colors change or wings be stunted or weak?

Before the scheduled launch, the Georgia students took a bus to the Kennedy Space Center in Florida to see off their space-faring creatures. But moments before liftoff, a sensor warned of a hydrogen leak. It turned out to be a false alarm, but in the meantime, the launch was delayed. Bad weather scuttled the second countdown. Ready for myriad snafus, the students restocked the research habitat with new sets of specimens, synchronized for the appropriate stages in their 21- to 22-day life cycle. Finally, on a third attempt, the shuttle blasted off.

Prior microgravity experimentation made some degree of success likely. Popular views are of astronauts floating while catnapping, or working robotic arms. But NASA's elite often manipulate specially designed test tubes, petri dishes and creature cages aboard the space shuttles for the sake of basic science and commercial research. On John Glenn's famous 1998 return to space flight—which the students watched blast off from Florida's Cape Canaveral in preparation for their experiment—the Senator helped conduct research on new space-age materials.

Before the painted ladies (*Cynthia cardui*), other less beautiful creatures had already ventured into space. Arabella and Anita, two notorious spiders, learned how to construct normal webs aboard Skylab, a U.S. space station launched into Earth's orbit in 1973. Subjects in other Skylab experiments that followed—some of which can be found in the Smithsonian's collections—included fish, monkeys, ants and bees.

In the wake of the Apollo moon shots, the Skylab program demonstrated the feasibility of spending at

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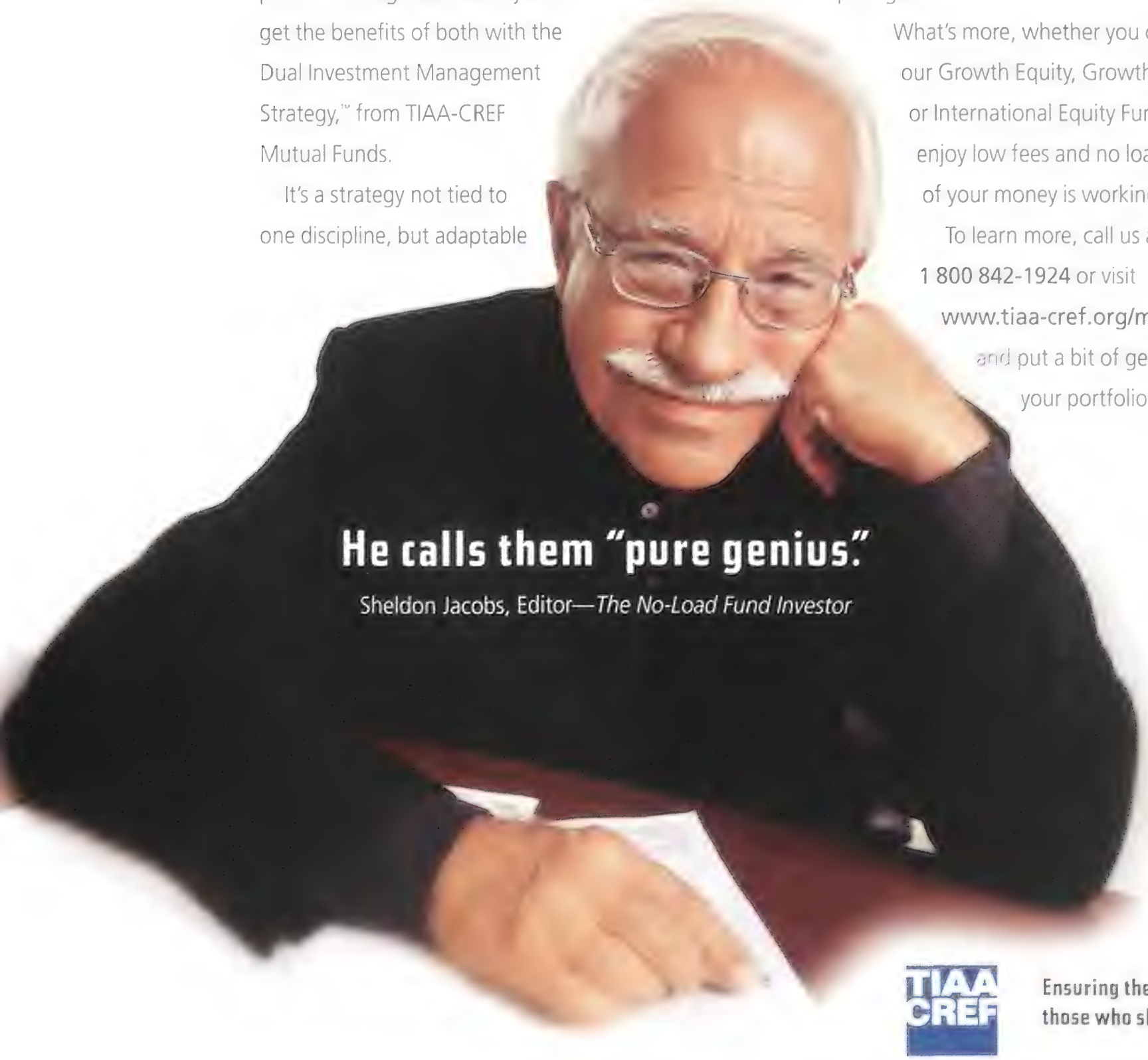

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least several months in space. Astronauts on Skylab conducted nearly 300 distinct investigations, including 19 student experiments.

When the program was abandoned in the mid-1970s, NASA turned to shuttle flights and experiments in Spacelab research modules (which were eventually replaced by the larger SPACEHAB modules). Meanwhile, the Russian space agency extended flight durations for their cosmonauts, keeping them orbiting for more than a year at a time on the Salyut space stations and then on Mir.

Now that the International Space Station has begun 15 years of continuous habitation, many speculate that microgravity research will not only help humans travel to or even inhabit Mars but will also help them on Earth. Everything from developing advanced atomic lasers and new immunotherapies to growing three-dimensional tissues and even organs in space may eventually be possible.

The multibillion dollar station, which will ultimately weigh in at 470 tons, is expected to foster unprecedented long-term research facilities and collaborations between the participating American, Russian, European, Japanese, Canadian and Brazilian space agencies.

In February of this year, the first of six research modules—this one dubbed Destiny—was attached to the International Space Station, enabling crews to begin full-time research, with as many as 12 racks devoted to ongoing experiments.

Though much microgravity research will continue to be done on or near Earth—in bioreactors, drop towers, and special aircraft and rocket trajectories—these venues provide only short-lived seconds of near zero gravity conditions. The Space Station will increasingly provide opportunities to conduct research in these conditions that spans weeks and months, even years.

Freed from the limits of gravity, many substances behave differently, because subtle forces become unmasked. For instance, diffusion is the natural tendency of materials to spread themselves evenly in a fluid. But on Earth, this effect is tempered by the gravity-induced facts of sedimentation and buoyancy, which separate materials from one another based on their density. In space, scientists can study pure diffusion. Likewise, research in combustion science, molecular biology and fundamental physics—among other fields—can benefit greatly from a nearly gravity-free environment. That basic research, in turn, may lead to more efficient ways of creating and processing materials here on Earth—and in space.

One by one, from crusted cocoons, emerged three-inch-wide butterflies dappled with pale orange, white, brown and black.

Most of the early experiments will focus on how microgravity conditions might affect crew members on long voyages. Still, much of that research may have implications for the rest of us. It seems that the absence of gravity affects the human body in ways that mimic degenerative diseases prevalent among the elderly, including bone loss, balance problems and weakened immunity. As countermeasures are developed for astronauts, better treatments for osteoporosis and spinal cord injuries here on Earth could also result.

In many areas of microgravity research, says Eugene Trinh, director of the physical sciences division of NASA's Office of Biological and Physical Research, "our scientific understanding is far from complete. A long-term basic research platform in space will help us make the next quantum leaps forward." In the meantime, research will continue aboard the space station and—as with the butterflies—on shuttle missions.

Back in their Georgia classroom after the shuttle launch in late July 1999, the students anxiously watched their experiment unfold on the Internet. The fate of their habitat had been entrusted to Lieut. Col. Eileen Collins, the first woman to command a shuttle mission. NASA ground personnel relayed real-time images of the insects in their clear Lexan box. The larvae, floating and turning in the air, slowly spun silky envelopes and slipped inside. And one by one, from the crusted cocoons the students had affixed to the crossbar, emerged three-inch-wide butterflies dappled with pale orange, white, brown and black. Nature had prevailed.

"This museum is dedicated to all explorers of air and space," says Gen. John R. Dailey, director of the National Air and Space Museum, and formerly second in command at NASA. "These butterflies show that young people, not just adults, can be space explorers, contributing to knowledge."

Through its research opportunities and Internet broadcasts, SPACEHAB hopes to expand the S*T*A*R*S program to reach hundreds of thousands—if not millions—of students around the world. Next April, six more student experiments will fly aboard the shuttle, including a silkworm experiment designed by Chinese students. Already, this past March, a S*T*A*R*S experiment—involving teams of students from around the world—was begun on Zvezda, an all-purpose Russian module on the space station.

Kimberly Campbell, S*T*A*R*S' program manager, believes the main benefit of the student programs will be kindling enthusiasm for space, science and engineering. "It challenges young minds to ask 'Why?' and provides the tools necessary to discover the answers on their own."

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TOMORROW'S CURES

Communing with Ancestors

A ROYAL STOOL BY THE SONGO PEOPLES IN Malanje Province, Angola, takes the form of a female ancestor supporting an object where a titleholder might sit. Her nude body is shown touching the earth, alluding to the connection between this land and the world where ancestors dwell.

Like most of the works in the exhibition "In the Presence of Spirits: African Art from the National Museum of Ethnology, Lisbon," the stool reflects the influence of the supernatural in sub-Saharan Africa. On view June 10 through October 14 at the National Museum of African Art, the show also includes dolls, staffs and other objects used by royals, priests and diviners to summon spirits. Only a few of the objects in the exhibition, organized by the Museum for African Art in New York, have been seen outside of Europe. —*Lucinda Moore*

SMITHSONIAN

HIGHLIGHTS

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Exhibitions and Events

GEORGE GUSTAV HEYE CENTER, NATIONAL MUSEUM OF THE AMERICAN INDIAN [NEW YORK CITY]

Seth Eastman Watercolors: A Soldier Artist Among the Dakota (through October 7) Fifty-six watercolor paintings by Eastman, a career Army officer, document everyday Dakota life in mid-19th-century Minnesota.

Beauty, Honor, and Tradition: The Legacy of Plains Indian Shirts (through November 4) Examines the history, iconography and construction of Plains Indians shirts from the 19th and 20th century.

ARTS AND INDUSTRIES BUILDING

On Gold Mountain: A Chinese American Experience (through September 30) The exhibition explores the experiences of six generations of a family who originally immigrated to California in the late 19th century.

Game Face: What Does a Female Athlete Look Like? (June 27 through October 7) Sponsored by MassMutual Financial Group and its affiliate, OppenheimerFunds, Inc. (see p. 66).

HIRSHHORN MUSEUM AND SCULPTURE GARDEN

Clyfford Still: Paintings, 1944-1960 (June 21 through September 16) Thirty-nine paintings focus on Still's mature style and reflect the development of abstract expressionism in his work.

COOPER-HEWITT, NATIONAL DESIGN MUSEUM [NEW YORK CITY]

Rooms with a View: Landscape & Wallpaper (through October 14) Traces the history of wallpaper and rooms decorated with landscape views.

THE NATIONAL MUSEUM OF AMERICAN HISTORY

Within These Walls (permanent) Features the museum's largest artifact, an 18th-century Georgian house, and tells the stories of the families who lived in it between the 1760s and the 1960s.

Ella Fitzgerald: First Lady of Song (indefinite) Exhibition documents the jazz artist's career through sheet music, her numerous awards, and audio and video footage.

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NATIONAL POSTAL MUSEUM

Roberto Clemente (through October 15) Souvenirs from the career of the baseball legend who is being featured on a United States postage stamp.

FREER GALLERY OF ART

Dinner for Five: Japanese Serving Dishes for Elegant Meals (through October 21) Ceramic dishes used for the light meal called *kaiseki* developed into a major category of Japanese ceramics during the late 16th century.

Real and Imagined Places in Japanese Art (through October 21) Japanese paintings, ceramics and lacquer works from the 12th through the 19th century depict real and imagined places.

SMITHSONIAN TREASURES TO GO

During the renovation of the Smithsonian American Art Museum, some 500 artworks will tour the country. Museums hosting exhibitions this month include the Portland Museum of Art (Maine). For more information, call 202-275-1500 or click on "Treasures to Go" at americanart.si.edu.

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The Leaning Tower Straightens Up

IN PISA THE TILTED ONE IS BACK IN BUSINESS AFTER AN 11-YEAR EFFORT TO KEEP IT FROM COLLAPSING

BY RICHARD COVINGTON

There is not a breath of wind in the soft spring Tuscan air. Why then am I dangerously weaving about like a storm-tossed sailor with a too-short wooden peg leg? Up here on the bell chamber of the Leaning Tower of Pisa, those devilishly clever 14th-century architects tried to compensate for the tilt by inserting two more tiers of steps on the slanting south side than on the north. I am holding on for dear life to the railing as I navigate my way around these intruding steps, leaning deep into the tower to counterbalance the scary dip south. At a height of 170 feet, 20 feet below the top, this is one deck I don't want to slip off of. With the precarious lean of the tower today, I bet Galileo would have dropped the differently weighted lead balls on his toes, instead of, as legend has it, heaving them over the side to demonstrate the uniform acceleration of gravity.

Below me stretches the Piazza dei Miracoli, the most splendiferous assemblage of Romanesque architecture in Italy. Faced in gray-and-white striped marble and bristling with columns and arches, the cathedral, with its curiously Islamic dome and matching domed baptistery, rises from an emerald green lawn. Flanking one side of the piazza, the *camposanto*, or cemetery, is a gracefully elongated cloister enclosing a burial ground with earth reputedly brought back during the Crusades from Golgotha, the hill where Jesus was crucified, so that noble Pisans could rest in holy ground.

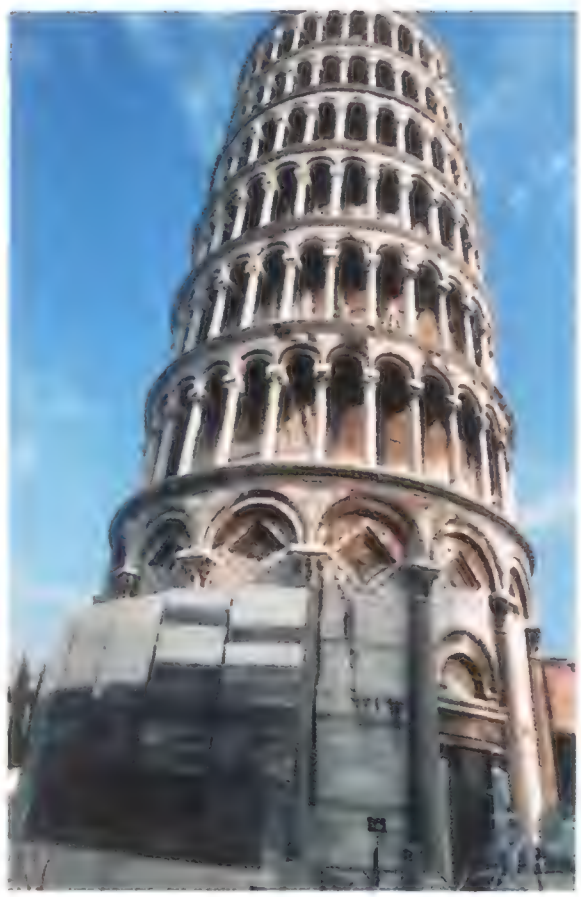
The Leaning Tower is the piazza's crowning glory. Although only a third as high as the Washington Monument, it was a miracle of medieval engineering, probably the tallest bell tower in Europe. With 207 columns ranged around eight stories, it looks like a massive wedding cake knocked precariously askew by a clumsy giant guest.

I can relate. Descending the 293 worn steps of the spiral staircase, my unruly feet display a mind of their own. On the higher north side, I lurch into the inner wall and seem to go uphill even though the steps go down. Rounding to the south, I carom back into the outer wall and careen down double-time. In this zigzag, up-and-down fashion, I wobble like a toddler down to terra firma, giddy with disorientation.

"Do you ever get used to the tilt?" I ask Paolo Heiniger, the chief engineer who is giving me a preview tour before this month's reopening of the tower. He sizes me up with the bemused tolerance of the veteran toward the shaky novice. "No, never," he responds laconically, as we emerge from the shadowed interior into bright sunshine.

The understated Heiniger is a patient fellow. After all, it took him and his crew years to move the tower a matter of inches. Never have so many worked so long and been so ecstatic to have achieved so little that meant so much. When the tower was closed in 1990, it was on the verge of collapse. In fact, according to the most advanced computer modeling, the tower shouldn't have been standing at all. The year before, another medieval bell tower 160 miles north in Pavia suddenly collapsed, killing four people. It was not even leaning. Justifiably alarmed, Italy's prime minister, Giulio Andreotti, closed Pisa's tower and appointed a panel of structural and geotechnical engineers, architects, art historians, archaeologists

On Pisa's Piazza dei Miracoli, the lean of the bell tower is obvious next to the straight lines of the cathedral.



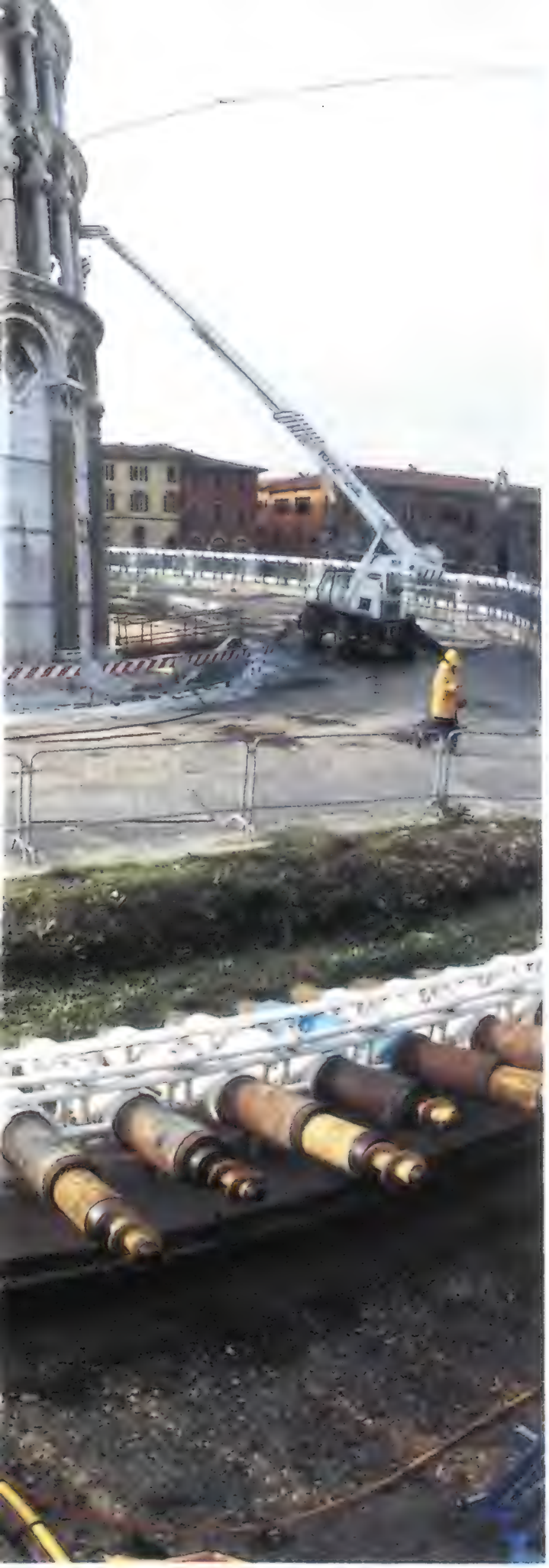
and conservation scholars with sole responsibility for hammering out a definitive solution to stabilize it.

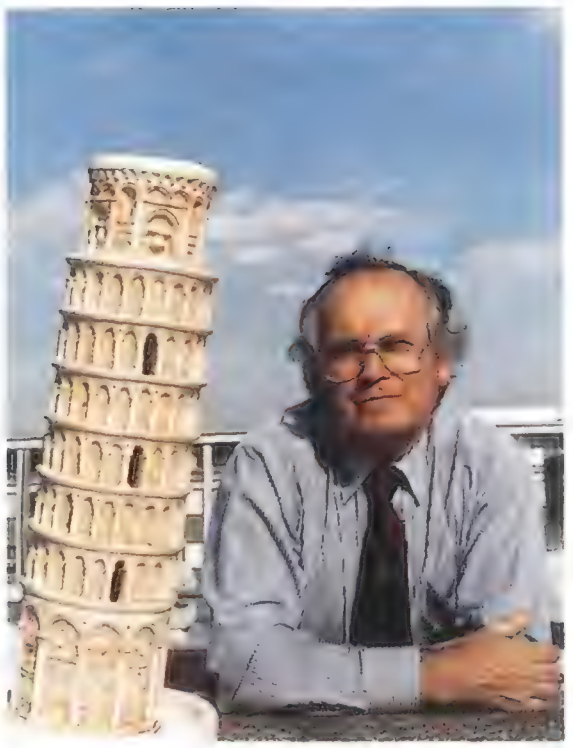
After more than a decade of contentious deliberations, at least one near-disaster, interminable bureaucratic delays, recurrent firestorms of criticism, and expenditures topping $30 million, the tilted one is back in business. On June 17, the blind tenor Andrea Bocelli will perform for the official reopening. The experts say the tower should be stable for at least another 300 years—barring major earthquakes, virtually nonexistent on Pisa's sandy plain.

After mulling over dozens of proposals to stabilize the tower, the 14-member committee settled on the most rudimentary option—the little-known technique of soil extraction. After gently angling 41 hollow tubes into the ground on the tower's north side, Heiniger and his crew used augers to drill 16 feet beneath the tower foundations. Over the course of two years, they extracted almost 80 tons of soil beneath the tower, ever so gradually coaxing the leaning south side to rotate to the north and tilt almost 16 inches less. The south edge of the top of the tower still leans out more than 15 feet beyond the base, but in 1990 it was leaning out almost 17 feet. The tower now has the inclination it did in 1800. Although this dramatic face-lift is not visible to the naked eye, it's made all the difference to the tower's stability.

Reducing the lean has also crucially diminished the stress on the tower's fragile walls. Although it looks solid from the outside, the tower is actually a hollow cylinder, 45 feet across, faced with ten-inch-thick marble blocks on the outer and inner walls; in between is rubble and mortar. The walls are nine to ten feet thick in most places, and narrow to five feet at junctures where the stairway corkscrews past. Where there are weak points in the tower structure, steel bolts are used to bind the inner and outer walls together, and unobtrusive steel bands wrap the patient with further reinforcement.

Construction began August 9, 1173,





Clockwise from left: Committee member John Burland, an engineer, promoted soil extraction as the best way to save the tower; workers anchor cable stays to the third level of the tower as a safeguard during construction; over a two-year period, some 80 tons of soil were extracted through 41 steel tubes, lessening the lean of the tower; while the final plan was on hold, 960 tons of lead ingots stabilized the tower in place; cable stays that braced the tower were connected to tripods 300 feet away.

when Pisa was among the most powerful city-states in Italy, an aggressive seafaring empire with colonies stretching across the Mediterranean, from Majorca in the west to Constantinople in the east. The city's affluent traders ate off gold plates and were building a baptistery of imposing opulence on a piazza grand enough to rival the forum of ancient Rome. White marble was chosen for the buildings to demonstrate that the Pisans were the indisputable heirs of the Roman Empire.

The tower started leaning almost from the outset. The architects had unwittingly planted it directly on top of the soft alluvial silt of a buried riverbed that had shifted course around the sixth century. The tower was erected in three separate bursts of construction, with nearly a century between the first and second phase and some 80 years between the second and third. External wars, internal strife, confusion over how to correct the lean or a mix of all three probably contributed to the long pauses. At each stage, the builders tried to compensate for its tilt, devising stratagems to make the tower appear more level. Tearing it down and starting over would have meant admitting defeat.

Ironically, the first few stories tilted north during construction. When the builders realized this, they made the columns and arches on the north taller than the ones on the south. Luckily, work stopped in 1178, partway up the fourth story. Had they gone any higher, the tower would have collapsed.

Nearly a century later, when construction resumed in 1272, the ground beneath the tower had compressed, and the unfinished structure gravitated south where the soil was softer. A new generation of builders responded like their earlier counterparts. Only this time around, columns, arches and stones were fashioned higher on the south side than on the north. When they completed the seventh story in 1278, work stopped once again.

GROUNDS AND DISPLAYED. INSTEAD OF
COMING TO SEE THE LEANING TOWER OF
PISA THEY WILL BE SEEING IT FIXED AND
ONCE AGAIN THEY
THE STAIRS TO THE TOP..
WHEN THIS INCREDABLE PROJECT IS UNDER
WAY IT SHOULD BE FILMED IN STAGES AND
SHOWN AT THE END.. THEN MADE INTO A
SHORT FILM
HAPPENED...
MUNCHER IN SCOTLAND
TO SEE THE FILM: THE EXPLODING TOWER OF PISA...
CONCRETTE CAN BE POURED AS SOON AS
TOWER PISA IS MADE TO STAND UPRIGHT. THE LIFTING
JACKS CAN BE LEFT IN THE CONCRETTE FOR EXTRA STRENGTH.
THE PUMP WILL BE BETTER FOR FORCING THE CONCRETTE IN
TO THE BIG GAPS LEFT BY THE LIFT.. AHH...
5

Over the years, dreamers and schemers have sent hundreds of proposals, such as the drawing above, for fixing the Leaning Tower.

Around 1360, yet another crop of builders added the belfry, angling it northward and adding those two unnerving extra steps on the south side to offset the worsening inclination.

Originally conceived as a sober monument to symmetry, the tower ended up looking more like a leaning banana. Over the next five centuries, the tower dipped farther south, its lean increasing from 1.6 degrees to 5 degrees, as the nearly 16,000-ton edifice leisurely subsided ten feet below ground level, burying much of the elegant foundation arcade. In 1838 the architect Alessandro della Gherardesca excavated a sunken walkway around the base of the tower so that visitors could once again view the campanile as the original architects had designed it. Unfortunately, work on the *catino* walkway caused the structure to pitch abruptly a good foot and a half at the top, exacerbating the tilt to almost 5.5 degrees.

Nearly a hundred years later, Benito Mussolini ordered that the drooping confection be shaped up into a more upstanding symbol for his Fascist dictatorship, with equally disastrous results. After Mussolini's engineers poured 80 tons of concrete into the foundations to prod it north, the tower perversely shifted farther southward. When Andreotti's panel of experts was appointed in March 1990, the Italians appeared more determined than ever to head off an imminent catastrophe. There had been 16 previous do-nothing committees that had been hamstrung by infighting among competing ministries. This time, number 17 reported directly to the prime minister.

Saving the Leaning Tower of Pisa was the ultimate civil engineering challenge. Presiding over its fall would be the ultimate dishonor. Debate within the committee—"14 prima donnas, all of whom know what's right," as one member quipped—could be ferocious. At times, the tower seemed more Babel than Leaning, for all the arguments—behind closed doors, in the media and on the streets—all raging around competing plans to stabilize it.

Simply righting the tower would have been child's play. Nearly so, at any rate. Early on the experts decided only to straighten it enough so that it would not topple over.

"Because the original builders constructed the tower in direct response to the movements of the subsoil, we wanted to respect that interaction, to preserve what I call the tower's genetic code," explains committee member Salvatore Settis in his office near the tower. Formerly director of the Getty Research Institute for the History of Art and Humanities in Los Angeles, Settis is now director of Italy's prestigious Scuole Normale Superiore, the training ground for the country's political and intellectual elite.

Renowned as a classical archaeologist and scholar of Italian Renaissance art, Settis rightly argues that the tower is indeed like a living organism, responding to changes in wind, sun, rain and temperature. The rainy season that starts around September and continues to February causes the tower to rise on the north and gravitate southward. In the spring, the process is reversed.

It must be the most carefully monitored building in the world, trussed up with inclinometers, levelometers, pendulums and specially designed instruments that detect the slightest widening in the tower's cracks. Infrared cameras track a daily sway of less than a hundredth of an inch as the tower rotates away from the sun.

Over the years an army of dreamers, dabblers and practical visionaries have deluged the various committees with hundreds of proposals. Some seemed eminently plausible; others have been real doozies. I had a particular affection for one whimsical offering sent in by a local primary school. It featured a Rube Goldberg contraption that employed huge chains and hooks attached

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to what looked like a Brobdingnagian back brace to prop up the ailing tower. Someone else volunteered the surefire notion of encasing the tower in polystyrene, craning it straight, then melting the stuff. One engineer e-mailed the committee with his less-than-appetizing plan for injecting beans and rice beneath the foundations. The hands-down winner for chutzpah, however, went to the proposal by an Italian-American to raise funds in the United States for a replica of the Statue of Liberty to valiantly buck up the tower.

In the early 1990s committee member John Burland jumped into the fray with his proposal to stack 660 tons of lead weights onto the north side of the tower as a temporary stabilization measure. A professor of soil mechanics at London's Imperial College of Science, Technology and Medicine, Burland had honed his debating skills in no less a forum than the British Parliament, where he successfully defended his controversial plan to shore up Big Ben during construction of the underground train line passing beneath the landmark clock tower.

But Pisa proved an altogether different story. If anything, the tower seemed to need a crash diet, not more weight. "When we first tried adding the lead ingots on the computer model, the tower fell over," a wry Burland explains from his London office. The professor went back to the drawing board. For nine long months, he and his students kept fiddling with the recalcitrant model.

At last, a computer simulation clicked. The lead ingots were put into place in July 1993. Although they worked like a charm, not only stopping the southward lean but bringing the structure back perceptibly north, the committee was lambasted for burdening the graceful monument with a monstrous eyesore.

Casting about for a less obtrusive—and less inflammatory—alternative, they authorized a complex plan in 1995

A U.S. sailor visiting Pisa in 1948 (top) stands on a tourist photo-op spot. Artist Keith Haring interprets the same pose.

to install a concrete ring around the tower's base, attach ten cables to the ring and anchor them 150 feet into compacted sand. Since the base had sunk below the water table, liquid nitrogen was injected into the ground at temperatures of -200 degrees Fahrenheit, to freeze the surrounding water to keep the area from flooding. And then, slicing through the catino's concrete walkway, Heiniger's men inadvertently cut through steel pipes connected to the tower. Installed in Mussolini's time, the pipes had been forgotten. It was too much for the capricious tower, which quickly made its displeasure known, lurching one-sixteenth of an inch south at an unprecedented speed.

"In one night, the tower moved as much as it normally did in a year," Burland explains. A hurried decision was made to add 300 more tons of lead ingots to halt the accelerating lean. Instead of removing all the weights, a third more were now in place. After what was soon dubbed Black September, the solution that had so dramatically backfired was abandoned.

After the debacle, another heated round of discussions ensued. Eventually, after several schemes were explored, soil extraction (a technique borrowed from a project to stabilize the main cathedral in Mexico City) emerged as the leading contender. Burland initially tested the method on small models of the tower in his London laboratory. Then he fabricated larger models in Bergamo, Italy, where they were placed in a centrifuge to simulate the pressure of gravity on a structure like the tower. Once these tests yielded positive results, he persuaded the committee to erect a 23-foot-wide concrete test cylinder, set off-balance like the tower, on a plot of ground north of the baptistery. When soil was slowly withdrawn from beneath this "footing," the whole model tilted northward exactly as predicted.

"We demonstrated that we could extract soil and form cavities that would close precisely," Burland explains. "We could steer by the amount of soil we took out and where we took it out." Next stop—the tower itself.

To ensure that the structure would be held rock steady during the drilling, massive cables encircling the tower's third story were stretched across the cathedral square to giant tripods 300 feet away. "The Tower Gets Braces," read one headline; "Tower Wears Suspenders," quipped another.

In February 1999, on the first day of drilling, Burland anxiously watched the traces of dirt emerge from the extraction unit. When clay began to spit out, the engineer was dismayed. He was counting on silt, not harder clay that could have unpredictable effects on the tower's settling. He put a bit of the soil on his teeth and tasted the sandy silt grains with gratification and relief.

"The tower has so many surprises and there had been so many near-disasters that the tension was enormous," Burland recalls. "We were watching the tower's delicate instrumentation minute by minute to make sure it was moving the way we had predicted."

It wasn't. Back in London a few days later, the engineer received urgent calls and faxes reporting that the tower had suddenly started veering sharply south again. "I thought it was all over," he recalls. "I had virtually written my letter of resignation."

Instead, he pressed Heiniger and others on-site to report every last detail of the tower's behavior and also the weather conditions. "It turned out that there was a gale blowing in from the Alps," says Burland. "I felt an immense relief because I knew that the tower always responded badly to rapid plunges in temperature. When the wind stopped, the temperature came up and the tower moved north again."

Afterward, the extraction technique worked beautifully. As Heiniger and his crew painstakingly withdrew the soil, they grew more adept at gauging the tower's reaction. The last extraction was carried out in January.

Now the unsightly lead ingots are gone, the thick, swaying steel harnesses stored away for who knows what eventuality, and visitors will once again have the chance to ride a roller coaster that doesn't move as they walk up and down the tricky tower.

Sages can debate forever the reasons the tower does not fall. But we know better. If this masterpiece of hubris in stone can blithely defy gravity and subvert the laws of physics, then there's hope yet for folly, romance and all the other enigmas that don't quite add up. That is what truly draws four million visitors to the piazza—the summons to witness a persistent miracle.

The committee has only made the tower stable, not sensible. With a tilt as rakish as Federico Fellini's Borsalino, the cockeyed tower remains an invitation, nay a command, to stay off-kilter. It's logic, not the tower, that has been stood on its head. The gods must be crazy. It cannot stand. It does stand. Impossible as ever.

Contributor Richard Covington lives near Paris and wrote last about Seattle's Experience Music Project in the June 2000 issue.

Tourists climbed the 293 steps to the top of the Leaning Tower before it was closed. This month the dizzying ascent will reopen, allowing those without acrophobia to once again admire the unparalleled view of the Piazza dei Miracoli.

Mapping Galactic

BY VALERIE JABLOW ◆ PHOTOGRAPHS BY MARNIE CRAWFORD SAMUELSON

SMITHSONIAN ASTRONOMER MARGARET GELLER PLOTTED THE BUBBLE STRUCTURE OF THE UNIVERSE. NOW SHE'SWORKING TO FIND OUT HOW IT GOT THAT WAY

Foam

On a wall of her office Margaret Geller has hung a picture of the stickman—her stickman. It is not large, perhaps a foot on each side. As stickmen go, in fact, this one is just average—or mind-bogglingly huge, depending on how you look at it. It is made up of astronomical structures extending for hundreds of millions of light-years. As most of us will see it, however, it's just this, a cartoon figure outlined by glowing galaxies set against the dark emptiness of space.

For the past 20 years Geller, an astronomer and professor at the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Massachusetts, has mapped the universe by plotting positions of galaxies. In 1986 the first of her maps, often called the stickman map, was evidence of something few had believed possible: on the largest scale, the universe has a distinct structure. With more plots, it became clear that the stickman was part of a pattern in which "walls" of galaxies surround vast areas with very few galaxies. Suddenly, the stickman map heralded a sea change in human perception.

In public lectures on her work, Geller likens the universe's 3-D pattern to soap bubbles or foam. (Imagine, if you will, a universe comprised of your kitchen sponge, its air pockets delineated by walls of galaxies instead of sponge material.) Though astronomers have argued over which—bubbles or foam—is more accurate, Geller hasn't let that bother her. Having convinced the astronomical community with the stickman map, she is set on cracking the universe's next big puzzle: how it got this way.

"One of the great challenges of modern cosmology is to discover what the geometry of the universe really is."

Margaret Geller's clear, ringing voice, a remnant of childhood acting lessons, reaches even the farthest corners of a sloping lecture hall

at the Harvard Science Center. Freshmen to seniors, English to economics majors, listen attentively. Their professor has notes, but rarely consults them. For 15 years, she has taught Astronomy 14, "The Universe and Everything," for anyone interested in the space we inhabit. The course is nearly always filled.

Today's lecture, on Einstein's general theory of relativity, at times seems far afield from Geller's mapping of the universe. She rolls a small metal ball across a suspended rubber mat. By pressing on the mat, she shows how changing the shape of space (the rubber mat) determines how the metal ball moves. Gravity,

Gravity is not simply a force, but geometry—and the heart of Geller's quest.

we learn, is not simply a force, but geometry—the heart of her quest.

"My father was a crystallographer," explains Geller in her CfA office half a mile from Harvard Yard. "He worked on the relationship between the arrangement of atoms in solids and their properties. He showed me the relation between geometry and nature, and I have always been fascinated with it. So it's no accident that I would do projects like these maps."

Now 53, the crystallographer's daughter is busy planning her next act, a map of galaxies seven billion light-years away. The idea is not to chart the nearby, current universe. The stickman map did that—albeit for only a tiny slice of the sky. The goal this time is to discern meaning from galactic geometry over time. Only great distances allow such time travel, for the farther out you look, the farther back in time you go. Andromeda, for instance, the closest large galaxy to our own Milky Way, is more than two million light-years away. Light generated by it appears two million years afterward in our telescopes. Geller's new survey will look deep into space at a seven-billion-year-old universe. About half the universe's age, that region should allow Geller to chart geometric changes over time by comparison with the newer universe closer by.

To illustrate, Geller pulls a physics book off shelves opposite her desk. She flips to a picture of the stickman. On the next page is another map, showing undifferentiated blotches and blobs. Created from measurements of background radiation remaining from the big bang by NASA's COBE (Cosmic Background Explorer) satellite, this map is our best picture of the very early universe, just 200,000 years after it was formed. Geller cradles the book. "The idea is that the COBE map shows that there was very little structure, and the stickman shows that there are very large, very well-defined structures. The contrast between these two specifies the puzzle. I think these are used as a kind of icon for the real problem: How do objects

form and evolve in the universe?"

To even start toward an answer for that, you need a big telescope. Geller will use the Smithsonian's newly redesigned one on Mount Hopkins in Arizona. The instrument was initially named the Multiple Mirror Telescope (MMT) because it contained six 72-inch mirrors that acted like one giant mirror 176 inches (or 14 feet, 8 inches) wide. In spring 1999, a single 21-foot mirror replaced the smaller ones. The converted MMT (as it is still called) is now ideally suited for peering at galaxies seven billion light-years away.

But in mapping the universe, it isn't enough just to *see* galaxies. Their distance must also be understood so that their location in space can be mapped. To do that, astronomers take advantage of an old idea: redshift. In 1929 astronomer Edwin Hubble recognized that galaxies appear to move away from us at speeds proportional to their distances. As a result, the spectrum of light from a galaxy "shifts" toward the red end of the spectrum with the apparent speed, and distance, of that galaxy: the larger the redshift, the greater the galaxy's speed and distance. Thus, to calculate the distance of far-off galaxies, astronomers measure redshift.

Geller is finding faster ways to plot redshifts with help from a fellow CfA scientist, Dan Fabricant. He created a hectospec to permit the MMT to quickly scan the skies. The crowded CfA lab where Fabricant's creation has been realized looks more like a machine shop, however, than a testing ground for delicate astronomical instrumentation. Most of the room, in fact, is taken up by a clumsy-looking circular structure. With 300 thin steel rods radiating evenly from its edge toward a two-foot-diameter stainless steel plate in the middle, it has the appearance of a large eye with a two foot metal pupil. This ersatz "eye," Fabricant explains, will be placed behind the new MMT mirror, with the mirror's gathered light focused onto prisms at the ends of the rods.

In mapping the universe, it isn't enough to *see* galaxies. You need distance too.

The stickman map (top, left) indicated that the universe has distinct patterns, shown here by galaxies (dots) lining vast dark areas. Previously, only smaller portions of the universe had been mapped, revealing few patterns. Above, an artist's cross-section depicts an even larger section of the 3-D "bubble" universe that Margaret Geller and colleagues mapped, containing the stickman (red). Galaxies are arrayed on the surfaces of the bubbles.

ILLUSTRATION BY SALLY J. BENSUSEN

The real stars of Fabricant's creation are two small, innocuous-looking "boxes" suspended from metal tracks. Around this CfA lab, they are better known as Fred and Ginger, though at this moment their progenitor refuses to distinguish one from the other. "Your choice," Fabricant laughs. "They look alike."

Named by Geller after that famously fluid pair of cinematic dancers, Fred and Ginger must in fact imitate the grace and skill of their namesakes while aiding in the observation of galaxies. Each robot glides along its track suspended above the steel eye. Moving as fast as three feet per second, the robots position the steel rods on the metal surface at points where observers want to get more information. Concealed within each rod is a fiber-optic strand of delicate synthetic quartz. Though each fiber-optic strand is only 250 micrometers in diameter—about the width of two human hairs—it can transmit a galaxy's light to machines that can determine its spectrum and redshift.

What all this ungainly machinery offers is speed. When Geller began mapping the universe, researchers counted themselves lucky to get redshifts for 30 galaxies a night. Fred and Ginger's swift telescopic "dance," however, will allow Geller and her team to get redshifts for several thousand a night.

FOR SOMEONE WHO DREAMS OF OTHER worlds, Margaret Geller began her journey to celestial cartography with more earthly concerns. Despite immersing herself from an early age in acting, by the time she went to college at the University of California at Berkeley, she says, "I realized that being an actress wasn't really what I thought, because you repeated the same thing over and over. But I was still fascinated by the idea of theater, performing and being some other character. I liked the attention."

Berkeley's big, impersonal classes were a turnoff for Geller. The ones in science, though, tended to be smaller, and Geller gravitated toward physics. Like her father, she planned to pursue graduate studies in solid-state physics, but was advised against it by one of her professors. "He said you want to look for a field that will be exciting ten years after you get your PhD, because that's when you'll be mature as a scientist." He suggested

Fred and Ginger's "dance" makes possible several thousand redshifts nightly.

Dan Fabricant developed this hectospec, which allows optical fibers to be placed on images of individual galaxies so their redshifts and thus distances can be measured.

either astronomy or biophysics. Geller grins at the memory. "I couldn't imagine doing biophysics, whereas astronomy seemed sort of exciting."

After becoming only the second woman to get a physics PhD at Princeton, Geller came to the CfA in 1974 to continue work on galaxy clusters. Then, in the 1980s, researchers found a large, dark region in the universe where nothing could be seen. Like many, Geller and CfA coworker John Huchra did not believe that such empty regions could be common.

"John and I started to do a survey of nearby clusters of galaxies. It took me a long time to understand that the real issue was the existence of large-scale patterns. People thought that these large-scale patterns didn't exist, so why go look for them?" Geller laughs, her hands as animated as her voice. "One of the things that made us recognize that there might be bigger structures was that study of the dark region. Of course, in the great wisdom of thinking you know the answer, I and many others thought it must be a mistake."

So she set out to prove it so. She and her colleagues decided to think big and map not just a thousand galaxies in a strip across the sky, as was the fashion, but many thousands

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over a period of years. With few qualms about nights in the cold, remote confines of mountaintop telescopes, her collaborators would obtain much of the data while Geller interpreted it back in Cambridge.

Geller decided that if they were to find any pattern, it was most likely over a wide range. Thus, to get an idea of the shape and size of the universe's "continents and oceans," she figured that neither random sampling nor intensive study of one small patch, which previous surveys had used, would work well. Instead, they would examine thin "slices" running across the sky, each six degrees wide. They hoped the very width of the slices would give a good sampling of the universe's structure.

No one could have predicted what that first slice of the sky would show. "We were lucky that it was such a clean picture," Geller says, "because if it hadn't been, we wouldn't have seen it, as few believed in those kinds of big patterns in the universe." Today, with large mapping surveys under way, studying the structure of the universe has never been more in vogue. "The fact that there were such clear patterns," says Geller, "really captured people's imaginations."

Geller enjoys talking about her own captive imagination during a lecture she gave to a group of Hollywood TV producers shortly before winning a MacArthur Fellowship in 1990. "I sat at the head table," she remembers with a smile, "and was introduced to a number of people, one of whom was Michael Eisner. It did not register with me that it was *the* Michael Eisner. I explained how we did a strip of the universe to figure out if it had 'continents' and 'oceans,' so I did a demo by cutting up a map. I needed somebody to hold it, so I turned to Eisner and asked him. As soon as he stood up, flashbulbs went off, and I thought, 'Ooh, I must be doing a great job!'"

Her laughter echoes against the stickman picture and into the adjacent corridor, where pictures of the MMT hang.

No one could have predicted what that first slice of the sky would show.

"WHERE ARE THEY? HOMEWORK IS due. Must be easy."

Margaret Geller sounds uncharacteristically anxious. In this hour before her class, she sits in the Harvard Science Center's café cum study hall, waiting for students to show up for help. Now, with only ten minutes to go, the first student finally comes around. A teaching assistant comes to his aid as Geller rushes off to make sure everything is in place for her class—her performance.

Today, most of the props from her previous class have returned, including a large, clear blue inflatable ball that Geller uses to show how parallel lines behave in a closed universe. (They intersect.) But as she spends the first ten minutes explaining how students should prepare for the midterm, just a week away, their tension becomes palpable. This is not an easy course by anyone's description, and what is needed, Geller explains now with carefully staged gesture, tone and smile, is not just correct answers but understanding. "If you show you don't understand," she warns, "we'll deduct points. We're looking to see that you really understand what you've been learning."

For a scientist engaged in work that often takes decades before coming to fruition, Geller has achieved moderate fame not only as an astronomer, lecturer, TV show guest and member of the National Academy of Sciences but also as a teacher and adviser. Today, in fact, one of her former graduate students, a new assistant professor at Brown, meets up with her at CfA after class.

"Ian has taken the most beautiful images of clusters," Geller says by way of introduction. Ian Dell'Antonio himself is far more modest. He is studying where dark matter resides in galaxies and why. But for now, he is concerned about the introductory astronomy course he teaches, where a student of Egyptology keeps him on his toes about what the ancient Egyptians did, and did not, know about the practice of astronomy.

As her former student talks, Geller looks happy, dreamy. In a short film she cowrote on her work as an astronomical mapmaker, Geller included a photograph of herself as a young child. In a light summer dress and blowing a dandelion gone to seed, she appears to be not of the moment but of worlds beyond. Geller wears the exact same look now, as if she is indeed among galaxies, gazing out only occasionally to those who remain earthbound.

"There's something really beautiful about science, that human beings can ask these questions and can answer them," Margaret Geller says about her life as a mapmaker of the universe. "You can make models of nature and understand how it works. There's something exquisite and beautiful about that."

Valerie Jablow is an assistant editor. Marnie Crawford Samuelson specializes in portraits.

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Sage Grouse

THE STAR OF ONE OF NATURE'S MOST SPECTACULAR SPRING SHOWS IS LOSING GROUND AND MAY BE HEADED FOR THE FEDERAL ENDANGERED SPECIES LIST

IT WAS DARK, THE KIND OF DARK THAT YOU find these days only in the remoter corners of the West—the high desert of eastern Idaho's Snake River Plain, in this case. Overhead there was a sky crammed to capacity with stars, the inky silhouette of jagged mountains on the dim horizon, and only a few lights down below, where a couple of farmers were pulling a midnight shift to bring in their wheat, the dust and chaff forming glowing halos around their floodlit combines.

Eventually, even the combines faded into the distance. We bumped for miles down a rutted dirt track, kangaroo rats bouncing like pinballs out of our way, until wildlife biologist Jack Connelly eased the old Idaho Department of Fish and Game pickup off the side and set the parking brake. Then he and his two assistants began assembling their unlikely assortment of equipment. Nathan Burkepile, a PhD student, put on a canvas backpack containing a 30-pound battery, and slung a radio receiver over one shoulder and a heavy boom box with a homemade strap over the other. In one hand he held a directional antenna attached to the radio receiver, in the other, a huge spotlight of the sort preferred by poachers. A pair of soundproof earmuffs hung around his neck.

Thalia Sachtleben, a young biologist from New Zealand, handed out giant fishing nets, of a size appropriate for large salmon or muskellunge. I eyed the nets dubiously; we were supposed to be searching for sage grouse, the signature bird of the vast sagebrush plains of the intermountain West, but all I could think about were those late-night "snipe hunts" at Scout camp 30 years ago in which we'd tricked younger boys into spending hours in the woods, in the dark, holding nets for an imaginary bird that never came. This was starting to feel like cosmic revenge.

And then the whole thing got weirder, if that's possible. Burkepile had been waving the grid-shaped antenna around his head, one hand cupped to a tiny earpiece that

Strut Their Stuff

BY SCOTT WEIDENSAUL

PHOTOGRAPHS BY GLENN OAKLEY

ran from the radio receiver; now he had a signal—a sage grouse somewhere in the darkness—so he slipped the big soundproof muffs over his ears, punched a button on the boom box and turned on the spotlight. Suddenly, U2's version of "Helter Skelter" blasted at high decibels across the empty landscape, and we stepped out in single file behind Burkepile as he and his phantom radio signal led us across the desert. We marched, unconsciously in time with the music, our nets at port arms: we looked like lunatics on parade. It was as surreal, as absurd, as any moment I've experienced that presumes to call itself science.

But there was method to Jack Connelly's apparent madness. The light and noise would cover the sound of our approach as Burkepile followed the radio signal to a bird wearing a miniature transmitter; then we'd have a chance to plop our nets over the dazzled, bewildered members of the flock. Through such oddball subterfuge, Connelly and a handful of other biologists are learning more about sage grouse ecology—and working against the clock to discover why this remarkable bird is in deep, deep trouble.

Across their entire range, sage grouse are in decline—missing from many areas where they once were found, threatened in others, plunging in number even in historic strongholds like the Snake River Plain and Big Desert regions of southern Idaho. Their peril, biologists say, stems from our long abuse of the sagebrush plains on which the birds are utterly dependent, an ecosystem that has been misunderstood and debased since the first settlers arrived. Now, as momentum builds toward listing the sage grouse under the federal Endangered Species Act—a development many predict will spark an environmental battle to match the spotted owl/logging debate—research like Connelly's is

Sexual seduction sage-grouse style begins with fanned tail feathers, and puffed up ruff and chest, and ends with a dance.

In search of sage grouse, Nathan Burkepile, left, Jack Connelly and the author walk in an Idaho conga line to the beat of U2. Sage grouse (below) dust it up in a lek territorial dispute.

providing answers for last-ditch conservation efforts.

Sage grouse are big birds, North America's largest grouse; males may weigh up to seven pounds and measure almost 30 inches from their bill to the tip of their long, pointed tail feathers, with females about two-thirds that size. Their plumage is a cryptic mix of brown, gray and buff, with a black bib, but the males also have a white ruff around the neck and chest.

It is in early spring, often before the snow and ice melt, that the sage grouse really shine—the time they begin their weird mating ritual, a treat for both the eyes and ears. As with several members of the grouse family, males display by the dozens, sometimes the hundreds, on communal courtship grounds known as leks, starting in the cold, orange light of dawn. When the cock begins his strut, he fans his spiky tail feathers and erects the fleshy yellow combs above his eyes; raises a corona of long, filamentous feathers around the back of his head; and inflates two large, greenish yellow air sacs in his chest, which peek out from his distended white ruff.

The effect is at once elegant and faintly ridiculous, as though the grouse were a well-endowed matron wearing yellow mascara and a white feather boa, and showing an indelicate amount of cleavage. Nor does the pageantry end with the bird's plumage. In a highly ritualized display, the male rears back, quickly draws his wings across the stiff feathers of the ruff several times, producing a swishing sound, and makes a couple of extraordinarily loud, liquid "plops" that are amplified through the air sacs and can be heard as much as three miles away. The strut is repeated endlessly, eight or ten times a minute during the busiest display period after dawn. Now imagine dozens and dozens of males, all swishing and plopping away like mad, and you'll begin to understand why sage grouse courtship is considered one of the great wildlife spectacles on the continent.

The first scientific description of the sage grouse came from Lewis and Clark, who encountered the bird they called

Sagebrush is the grouse's universe, defining its existence at every season of the year.

"cock of the plains" in 1805 along the Marias River in what would become Montana. But the Indian tribes of the sagebrush country had long before melded the grouse into their culture—hunting it for its meat, mimicking the bird's dance, using its feathers in their clothing and rituals.

Early settlers found sage grouse in almost unbelievable numbers; George Bird Grinnell, a pioneering conservationist, recalled seeing thousands passing his camp in Wyoming one day in 1886 that "reminded me of the old-time flights of Passenger Pigeons that I used to see when I was a boy." The grouse thrived in the harsh, arid world of the shrub-steppe plains—a unique, sagebrush-and-grass-dominated ecosystem originally stretching from southern British Columbia through Saskatchewan in the north, to the western Dakotas, south through Nevada, Utah and northern New Mexico, and west into California.

Even today, with its range diminished by agriculture and grazing, sagebrush still covers hundreds of thousands of square miles—but it is not the monoculture of gray-green shrubs that it appears to the untrained eye. There are many species of sagebrush (which, just to make things confusing, is not a sage at all but an *Artemisia*, a member of the wormwood family).

Sagebrush is the grouse's universe, defining its existence at every season of the year. In winter, sagebrush leaves and buds form more than 99 percent of the grouse's diet, and even in spring and summer, when tender forbs such as salsify and dandelion are eagerly eaten, the grouse do not stray far from good sage cover. Sagebrush is only half the story, though; like a miniature savanna forest, the knee-high shrubs mingle with and overshadow a diverse mix of native bunchgrasses and wildflowers. Those perennials make good forage for livestock, and ranchers have long viewed sagebrush—inedible to cattle—as a competitor and pest of the first order, to be assaulted with fire, machinery and herbicidal sprays.

According to one recent estimate by the U.S. Geological Survey, 99 percent of the shrub-steppe habitat in the Great Basin has been impacted by grazing. Much has been destroyed completely, and in some areas, 70 percent of the sagebrush has been converted to agricultural crops. Clait E. Braun, recently retired from the Colorado Division of Wildlife and one of the acknowledged experts on sage grouse, says bluntly that no untouched, undamaged grouse habitat remains anywhere in the West.

These are dark days for sage grouse. Of the 16 states and three Canadian provinces where they were once found, the birds have disappeared entirely from Nebraska, Kansas, Oklahoma, New Mexico, Arizona and British Columbia, with relic populations of a few hundred left in Alberta and Saskatchewan. The Dakotas and Washington, Braun said, have fewer than 2,000 birds each, and California's sage grouse probably number fewer than 5,000. Substantial flocks remain only in seven states, with Montana, Oregon and Wyoming having the most—but even in such bastions, the number of males coming to leks has sagged by as much as 30 percent in the past 10 to 15 years.

Braun estimates that the overall population has dwindled from what was likely about two million birds to barely 200,000 now. "That's a tremendous decline in the 200 years since Lewis and Clark discovered them," Braun lamented.

Jack Connelly has studied sage grouse in Idaho since 1977 and fears their already declining numbers will plummet unless their vast sagebrush habitat is protected.

Since 1999, the process to list sage grouse populations in Washington State and Colorado under the federal Endangered Species Act (ESA) has begun, and many observers feel that threatened or endangered status is just a matter of time for sage grouse as a whole. Because most of

PP. 56-57 DOMINIQUE BRAUD/ANIMALS ANIMALS; ERWIN AND PEGGY BAUER; DON ENGER/ANIMALS ANIMALS; DOMINIQUE BRAUD/ANIMALS ANIMALS

Storm clouds gather over the foothills of the Bitterroot Range on the Idaho-Montana border, prime sage grouse country; the bird's range covers huge areas of shrub-steppe plains that are being lost to grazing, farming and fires.

their habitat is also grazing land, much of it leased to private ranchers but controlled by the federal Bureau of Land Management (BLM) or U.S. Forest Service, the implications of an ESA listing could be profound, provoking wholesale changes in everything from how many cows can be kept on given parcels, and restrictions on water use, to what pesticides and herbicides are allowed and under what conditions. An Endangered Species listing could affect virtually every farm and ranch in the bird's range.

While political controversy swirls around them, sage grouse go about their business as they have for eons. A lek is the focal point of a sage grouse population, pulling in birds from vast distances, and used generation after generation. Sometimes the lek is on an open hilltop or a dry lake bed, but it always has good visibility—the better to see and be seen. "Some of these leks have been used since God was a child, especially stable old lake beds—maybe for thousands of years, who knows?" Connelly told me one day. The bond to a lek can be so strong that even massive changes to the landscape may not deflect the birds. Jessica Young, a researcher at Western State College of Colorado, tells the poignant story of a lek that was obliterated by the creation of the huge Blue Mesa Reservoir. Thereafter, a steadily dwindling number of males returned to strut on the wide, bare ice, dangerously exposed to predators, high above the spot where their forefathers once danced.

"Some leks have been used since God was a child—maybe thousands of years, who knows?"

Even though the males gather in large numbers on the lek, their order isn't random; each defends a small territory that may only be a few yards wide, with frequent fights erupting between neighboring birds. The most successful cocks are usually found near the center of the lek—the spot safest from attacks by predators like golden eagles, and the location to which arriving females gravitate.

But male sage grouse are all show. After the brief moment of copulation, the male has nothing more to do with the female, which leaves the lek and moves off to her nesting territory, which may be many miles away. Within two or three weeks of mating, the female hunkers down beneath a protective umbrella of sagebrush and incubates a clutch of six or seven eggs for the next month.

The Table Butte population, one of several Jack Connelly studies in eastern Idaho, includes about 400 birds that use six leks. The females spread out over shrub-steppe to nest; then when the chicks hatch, some families move into farm fields, where the females nibble on succulent forbs like alfalfa, dandelion and clover, and the new chicks can feed on insects. Others move to higher ground in the mountain foothills or to moist areas along streams.

I followed Connelly up a high, crumbling knob of lichen-encrusted lava near Table Butte. "The birds from those six leks will spread out over almost all of the land you see, hundreds and hundreds of square miles," Connelly said, sweeping his arm across the dusty landscape, beyond which the Bitterroot and Lemhi mountains rose

like blue cutouts against the sky. Most of what we saw was sagebrush, gray-green in the distance, but the view was deceiving; the Table Butte area is almost completely encircled by farms, with only one narrow corridor connecting it to other sage habitat. There are some farms off toward the highway a few miles away, sharp-edged rectangles of green alfalfa. While alfalfa can provide good summer range for the sage grouse, farmland robs the birds of essential habitat at other times of the year, especially winter, when the grouse subsist entirely on sage leaves, and when the higher elevations are inhospitable. Farms may also form a barrier to movement, though how much Connelly can't yet say. One of the remarkable things about sage grouse is how mobile a species it is; Connelly followed one radio-collared hen that made a 150-mile round-trip between her winter and summer range each year.

"Sage grouse are built to fly," Connelly explained. That means "it's more like we're managing for elk than for a game bird, because of the distances they cover.

"When people talk about protecting habitat for an animal, they traditionally think about protecting a small breeding area." But here, he nodded toward the surrounding Snake basin, "we're talking about 800 square miles. And that's where it gets ugly." The land over which the grouse wander is a mosaic of ownership, all controlled by agencies or individuals with different goals and priorities.

"We need huge swaths of land for sage grouse. We're told to buy a piece of ground to protect them. Fine, we'll take Idaho and part of Montana," he said with a wry grin.

Connelly has been working with sage grouse since 1977, and in that time he's seen big changes in both the landscape of southern Idaho and the fortunes of the grouse. Much of the best winter habitat has been converted to farmlands. Range fires are a continual threat to the remaining sagebrush, which even under ideal conditions takes up to 30 years to recover from a blaze. Because fires open the way for cheatgrass, a combustible alien weed that thrives in the wake of fires, Connelly sees a vicious and accelerating cycle in the shrub-steppe ecosystem. Cheatgrass chokes out sagebrush seedlings and native undergrowth while promoting even bigger and more devastating range fires, further eroding the habitat for sagebrush wildlife.

The impact of fire and cheatgrass on sagebrush-dependent species has been catastrophic, Connelly believes. In the past 15 years, he has seen a more than 80 percent decrease in grouse populations in many study areas.

Despite their size, sage grouse are awfully good at disappearing into the high desert, and their mobility makes it even harder to study them. So, like many wildlife biologists, Connelly depends on lightweight radio transmitters mounted on collars that slip around the bird's neck. But collaring a bird means catching it first, and as I soon found out, that in itself can be a challenge.

It had already been a long day, but by midnight I was stumbling along with my big landing net, rock music blasting in my ears, trying to follow Connelly and Sachtleben as they, in turn, followed Burkepile and his spotlight. We were unable to use our headlamps, for fear of spooking any grouse, so I tried not to trip on the nasty mix of broken lava rock and prickly pear cactus that studs the ground.

We went through the U2 tape several times, then switched to Pink Floyd at equal volume, as over the

course of five or six hours we covered miles of uneven terrain, fruitlessly chasing the phantom signals. Finally, Burkepile's beam stopped on a gap in the shrubs; I saw a pale body, a skinny neck craning up, trying to look beyond the blinding light, trying to decipher the odd, noisy danger.

Connelly sprinted forward, his widemouthed net low, and plopped it down on the bird just as the grouse tried to explode into flight. Others took off around us, the boom of their wings deafening over the sound of the music. One rocketed past my head like a dangerous projectile, wings thundering. Burkepile cornered another bird with the spotlight, and it was my turn to crash forward, dropping the net over a heavy male, which thrashed wildly. Trying to pin it down beneath the mesh, I slammed my hand down onto a cactus, driving several spines deep into my palm, where they would remain, painfully, for months. But at last we had two birds. Two fresh transmitters were slipped over their necks so the flexible antennas, no thicker than pencil leads, lay along the birds' backs. For the next year, the signals from these tiny devices would reveal the birds' wanderings as they moved from summer nesting areas to winter range to the courting leks in the spring.

You'd think that a bird that covers so much terrain would be at constant risk from predators and accidents, but researchers have found that adult survival rates are exceptionally high among sage grouse, which often live four to five years, or more. The "black hole," as Connelly puts it, is chick survival, which is abysmal on his Idaho study areas, the lowest of any North American game bird. Connelly and other researchers are focusing on what the grouse need to make it through the first, crucial weeks of a hatchling's life, and they're finding two important answers are herbaceous plants and bugs. Once the chicks hatch, they need to eat protein-rich insects like ants and beetles to thrive, before moving on to plants. A variety of management practices, including pesticide use, reduces the availability of the insects and plants. And so does fire, one of the gravest threats.

The "black hole" is chick survival, which is the lowest of any North American game bird.

I got an object lesson about the sweeping impact of fire in the sagebrush plains one day, poking around with Connelly in the Big Desert, a sprawling, volcanic region of southern Idaho that includes Craters of the Moon National Monument, and a huge federal nuclear research and storage facility. We were looking at the remains of a fire from 1996 that burned more than 200,000 acres—what had once been sagebrush but was now a mix of cheatgrass, crested wheatgrass (another exotic species) and a variety

A range fire burns across the Big Desert region of Idaho. Fires are devastating to the sagebrush, which can take 30 years to recover, and to the shrub's primary tenant, the sage grouse. Smoke rises from scorched remains (above right).

of native bunchgrasses that rolled to the horizon in every direction.

"It's a beautiful grassland, but for sage grouse, it isn't gonna cut it," Connelly said. "You can see that there's no seed source for sagebrush except at the edges—it's going to take a hell of a long time for this to recover."

As we wandered dirt roads around the butte, we noticed a smudge of white on the horizon—a new fire, caught by the gusty wind. Soon, the blaze had erupted across a huge chunk of the nuclear facility, and by late afternoon, orange-and-white tanker planes were bombing it with fire retardant as the smoke cloud grew to fill half the sky. Connelly stared grimly at the scene, tight-lipped; the fire was burning some of the finest remaining sage grouse habitat in the region. By the time it was contained, the blaze had consumed more than 30,000 acres of sagebrush—just part of some 500,000 acres that have gone up in flames in the area since 1996. The situation is even worse in Nevada, where range fires in 1999 scorched a record 1.8 million acres, most of it sage grouse habitat.

As if the tangled web of habitat loss, rangeland alteration and fire weren't complicated enough, now it is clear there are actually two distinct species of sage grouse—not one, as had been assumed for nearly two centuries. In the past decade, scientists working with sage grouse in southwestern Colorado and parts of Utah have documented physical, behavioral and genetic differences in the birds found there.

But the Gunnison sage grouse, as the new species is officially known, is in dire straits, with a spring breeding population of fewer than 4,000 individuals left, according to Jessica Young, one of the researchers who, with Clait Braun, helped identify the new species.

"I don't think there's one problem, there are many—anything that fragments, destroys or degrades the sagebrush habitat is the problem," Young said. "Grazing is probably the most significant, but there are also power lines, roads, developments. It's really us, and all the things we've brought along with us." Nearly a decade ago, a 1.1 million-ton pile of radioactive uranium mine tailings were disposed of in the middle of one of the largest remaining Gunnison grouse populations; that population suffered a 60 percent decline the following year, she said.

But that's not all. When Young and other researchers looked at the Gunnison's genetic variation, the results were frightening. "There are no wild bird populations that I am aware of that have a lower level of genetic diversity than the Gunnison sage grouse," according to Young.

A sage grouse gliding low over its habitat is a bird that is built to fly, with a seasonal range that can cover 150 miles.

No hunting is permitted for the Gunnison sage grouse. Most states still have at least limited hunting for the greater species, and while seasons and bag limits have become much more conservative, Connelly said, few biologists see tightly controlled hunting as a significant factor in the species' decline, especially when compared with the massive loss of habitat.

Few people doubt that the Gunnison birds technically qualify for federal Endangered Species Act protection. Recently, the U.S. Fish and Wildlife Service listed the bird as a "candidate species," a possible first step toward full protection under the ESA. But federal oversight, with its many land-use restrictions, is anathema in much of the West, and a broad coalition of folks, with disparate motivations, have long been eager to avoid such a listing.

Ironically, one of the more promising approaches for sage grouse may be local conservation plans that grow out of those coalitions. Representatives from federal, state and local government agencies, conservation organizations, and the livestock industry, university scientists and members of the general public formed the Gunnison Sage Grouse Working Group, which developed more than 200 conservation actions to reverse the decline of the birds, from lek enhancement to better livestock management.

Clait Braun sees real hope in the model of local working groups crafting their own plans. "It's a slow process, and we're not going to turn it around overnight," he warned. "It's going to take some money, and it's going to take some intestinal fortitude, especially on the part of the BLM, which has most of the birds on its property."

In the end, grouse advocates say, the sage grouse is only a symptom of a wider, more insidious ill—the way Americans have destroyed the sagebrush landscape of the West. "I think we look at the shrub-steppe ecosystem the way we once looked at wetlands," Young said. "There are still a lot of people who don't see the value in it. It's the place to put the landfills, to dump the uranium tailings. And if it's overgrazed, well, it's just sagebrush. This isn't really about sage grouse—it's about what we've done to a huge chunk of the United States that we haven't valued."

Nature writer Scott Weidensaul and photographer Glenn Oakley last worked together on "Return of the Elk" in December 1999.

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women athletes put on their game face

THERE WAS A TIME WHEN THE TERM "FEMALE ATHLETE" was an oxymoron. Muscles and sweat were not feminine, and few parents encouraged their daughters to compete in "unladylike" activities. But as women won more rights, attitudes began to change. Then along came Title IX, the 1972 law effectively mandating equal opportunity for girls in sports. It took years for the number of women with athletic skill to reach a critical mass, but finally there are professional women's teams in basketball and soccer, to name two.

When Jane Gottesman began writing for the *San Francisco Chronicle*'s sports section in the early 1990s, she noticed that pictures of women athletes were rare. What does a female athlete look like? She put the question to photographers and began collecting their responses. The result became "Game Face," an exhibition cocurated by Geoffrey Biddle that opens June 27 at the Smithsonian's Arts and Industries Building and will tour for five years. A book of the same name is being published by Random House. The photographs capture little girls just discovering what it feels like to test their skills, as well as seasoned athletes. First-person essays convey what it means to be a coach, an athlete or an athlete's mom. It's been a struggle from empty stands to a Rose Bowl sold out for the Women's World Cup. To every female athlete, whether on a professional team or just in a pickup game: you go, girl! —*Sally Scott Maran*

Christy Moultrie, a member of the Gray's Hill Clipperettes softball team, takes a determined stance in readiness for a pitch in St. Helena Island, South Carolina.

JEFFERY ALLAN SALTER

ANNIE LEIBOVITZ

Above: U.S. team member Lily Yip was caught mid-swing during the table tennis competition at the Olympic Games in Atlanta in 1996. Below: Patrina Thomas focuses her energy during the weight lifting event at the 1995 Olympic Festival in Colorado Springs. "I've been rejected for health insurance," she comments, "and I say, 'Dude, I'm an Olympic weightlifter! I wouldn't be about to do this if I wasn't in shape.'" Right: Rejoicing players from James Madison High School in Vienna, Virginia, celebrate their victory in the 1989 state softball championship.

DAVID BURNETT

LUI KIT WONG

"When I was ten years old and I was playing football, someone said, 'Block that dame!' And that's the first time I realized I was a girl."

—Pat McCormick, 1952 and 1956 Olympic gold medalist in springboard and platform diving

STEVEN G. SMITH

HEINZ KLUETMEIER

LYNN JOHNSON

"My participation, my focus, my intensity, my sacrifice for my sport. This is who I am. It's not just something I do."

—Jamila Wideman, basketball player, Stanford University and WNBA

Aimee Mullins, here at a San Diego track meet, set Paralympic records in 1996 in Atlanta in the 100-meter dash and the long jump. A role model challenging the narrow ideas of women in sports, she competed for Georgetown University on their NCAA Division I track team. Opposite, top: Kimberly Woodard consoles Lakesha Herring after Herring failed in her final attempt to qualify at the Tennessee High School State Track Meet. Woodard later won the regional qualifier. Opposite, bottom: University of Tennessee basketball coach Pat Summitt faces off with Chamique Holdsclaw. Summitt guided the Lady Volunteers to three consecutive NCAA championships. Holdsclaw, a member of those teams, went on to become the 1999 WNBA Rookie of the Year and played in the 2000 Olympics.

RAYMOND L. BRECHEISEN

Angela Harvey was 4 years old in 1987 when she participated in the "Mutton Busting" competition at a 4-H rodeo at the Crawford County Fairgrounds in Girard, Kansas. The object of the event for children 6 and under was to stay atop a sheep running at full speed.

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Eternal

For ancient Egyptians, entering the afterlife was literally a moment of truth. This scene from the c. 1200 B.C. *Book of the Dead*, Papyrus of Ani, portrays the weighing of the royal scribe's heart against a feather representing truth.

Egypt

BY DOUG STEWART

A LANDMARK TRAVELING EXHIBITION FEATURES MASTERWORKS FROM THE BRITISH MUSEUM'S COLLECTION OF ANCIENT EGYPTIAN ART

AMONG THE MOST EXQUISITE examples of Roman painting to have survived from ancient times is a portrait of a stylish young woman who lived in Roman-occupied Egypt around A.D. 170. Painted from life using colored beeswax on wood, the portrait typically would have been bound by linen strips to the outside of the woman's mummy. Egyptian households of the day sometimes included recently deceased members standing erect and tightly wrapped in a place of honor, perhaps in a narrow cupboard with a small door at the top for viewing their painted likeness. Romanized Egyptians thus managed to blend two very different traditions: the Roman use of portraiture in venerating one's forebears and the already ancient Egyptian custom of preserving their bodies for the afterlife.

That mummification persisted well into the Roman era is just one example of how Egyptian culture, though varying in its details over time, remained in its broad outlines almost unimaginably consistent for more than 30 centuries. The young woman's portrait is part of an enthralling new traveling exhibition, "Eternal Egypt: Masterworks of Ancient Art from the British Museum." The three-year, eight-city tour includes treasures representing every stage of ancient Egyptian civilization, from the time of the First Dynasty some 5,000 years ago to the Greco-Roman period of Alexander the Great and Cleopatra.

"These works reveal how extraordinarily sophisticated the artistic tal-

Rendered in a non-Egyptian, Hellenistic style, this Roman-period portrait of a young woman in Greco-Roman dress was made as a mummy mask. The Old Kingdom Egyptian alabaster statue (right) likely depicts a woman of royal birth. The small figure of a king (far right) is from 3000 B.C.

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The exhibition's oldest piece is a weathered ivory statuette of a king.

The elegant 4,600-year-old figure is slim but muscular.

ent of ancient Egypt was," says Sandra Knudsen, associate curator of ancient art at the Toledo Museum of Art, where the show premiered in March. The artwork on display runs the gamut from colossal to miniature, world famous to obscure: statuary in stone, bronze and wood, relief carvings, coffin lids, jewelry, glass, and delicate paintings on papyrus. Referring to the exhibition's oldest piece, a weathered, stoop-shouldered ivory statuette of what may be a First Dynasty king, she adds, "It's as if ancient Egyptian art burst into existence in 3000 B.C. with an already high level of technical skill. The style can change over time, but the level of talent and imagination you can see in this exhibition is fabulous."

After closing in Toledo on May 27, "Eternal Egypt" will be on view at Wonders: The Memphis International Cultural Series in Memphis, Tennessee, June 28 through October 21, and at the Brooklyn Museum of Art in New York, November 23 through February 24, 2002. It will move on to Kansas City in April 2002 and then travel to San Francisco, Minneapolis, Chicago and Baltimore. The show was mounted by the American Federation of Arts in conjunction with the British Museum, with support from the Ford Motor Company. Most of the objects the British Museum loaned to the new exhibition have never before been allowed to leave its confines. With several of its galleries now closed for renovations, the museum consented to let some of its most precious acquisitions travel.

The sprawling London institution houses the largest and most important collection of Egyptian art outside of Cairo. In the early 19th century, however, its trustees were slow to accord the stone pharaohs and animal-headed deities of the Nile Valley the status of "fine art" that they easily granted to Greek and Roman work. As with more than a few museumgoers today, the stylistic conventions of Egyptian tomb and temple art—the squared shoulders, the "silent march" with left foot advanced, the flattened perspective—impressed the gentlemen as stiff and a bit primitive, if not barbaric. In 1819 Henry Salt, the British consul general in Cairo, asked to be reimbursed for the superb collection of antiquities he'd been amassing on behalf of the museum—from an extravagant strand of silver and electrum amulets to a 3,000-pound head of Amenhotep III (p. 82). The trustees dithered for years before grudgingly paying what Salt deemed "the miserable sum of two thousand pounds"—£33,000 less than they'd just paid Lord Elgin for his Athenian marbles.

"There is a kind of austerity to Egyptian sculpture which to people brought up on Greek sculpture can be difficult to appreciate," says Vivian Davies, keeper of the British Museum's Department of Egyptian Antiquities. "Personally, I find Greek sculpture rather fussy, but I'm coming at it from a very different point of view."

By the late 1800s, the British Museum had a staff of trained Egyptologists, and the collection was growing in volume and scope. By the 1920s, the Egyptian galleries contained 57,000 objects. Today, there are more than 100,000, many from the museum's ongoing excavations in Egypt and Sudan.

The task of distilling 145 objects from 100,000 fell to the show's cura-

This Old Kingdom striding figure of the provincial official evokes a sense of tension.

Radiating energy, Meryrahashtef seems to be rushing to an appointment.

tor, Edna R. Russmann of the Brooklyn Museum of Art, where she is a curator of Egyptian, classical and ancient Middle Eastern art. Some of her choices, however, were vetoed as too fragile or precious to leave England. (The Rosetta stone is staying put.)

Russmann, in any case, made her selections with the eye of an art historian, not a traditional inscription-loving Egyptologist. "Years ago, a famous Belgian Egyptologist gave a lecture on some statues he was studying," she says. "For the whole hour, as I recall, he showed slides only of the backs of these statues, where the writing is." Russmann, who avoids the term "artifacts" as subtly demeaning to works of art, wants visitors to "Eternal Egypt" to come away with an appreciation for the sheer visual appeal of these objects and the mastery with which they were fashioned.

The classic conventions of Egyptian art were literally set in stone during the Old Kingdom, the age of the pyramids (SMITHSONIAN, September 1999). By the 27th century B.C., the Old Kingdom was centered around the ancient city of Memphis, near modern-day Cairo. The pharaoh, regarded by his subjects as divine and all-powerful, was a central focus of both art and religion. Artists were often, in effect, state officials charged with showing the king's greatness and virility: "smiting scenes," in which the king personally annihilated his enemies with a mace, were a particular favorite.

Pharaohs and their families led pampered lives, attended by royal hairdressers and royal manicurists. Still, the comforts of the Old Kingdom were relatively basic. The 4,600-year-old figure of what is probably a young princess, elegantly modeled in translucent Egyptian alabaster, is slim but muscular. "It's a reminder of how simple life was," Russmann says. "Even a royal woman still got around mostly by walking." The knee-hobbling dress the young woman wears is evidently a fiction. "Linen is the least stretchy fabric I know of. How could she have gotten into a linen dress that tight, much less moved in it?" Linen dresses recovered from tombs of the period are just baggy tubes with shoulder straps.

The great mass of Egyptians were tenant farmers. The state owned all their fields, which the flooding Nile fertilized every summer. "Only the towns remain above water, looking rather like the islands of the Aegean," wrote the Greek historian Herodotus in the fifth century B.C. Trees were scarce, so houses and even palaces were built of unbaked mud brick. Low-status men usually tilled the fields; their wives ground grain, baked bread, brewed beer and laboriously wove and washed (continually, according to a much-impressed Herodotus) the family's all-linen clothes.

Compared with the mass of peasants, even a provincial bureaucrat held an exalted rank. One such official, a man named Meryrahashtef, had himself immortalized in a single block of imported ebony—one of a number of small wooden statues of nonroyal subjects that appeared toward the end of the Old Kingdom. The nude figure is nothing like the chesty, symmetrical pharaohs one usually associates with Egyptian art. The man's slender torso bends forward and twists tensely to one side as his elongated left leg takes a giant stride forward. Radiating coiled energy, Meryrahashtef seems to be rushing to an appointment. The redoubtable Sir W. M. Flinders Petrie,

The hairstyle of this servant bearing a cosmetic box suggests she was a foreigner.

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A well-connected woman named Satdjehuty rated her own spectacular mummy mask.

the father of scientific archaeology, unearthed the remarkable piece in a debris-filled burial shaft near Cairo in the winter of 1920-21. As a funerary sculpture, it may have played some role in currying favor with the gods who ruled the afterlife, but precisely what is a mystery.

Egyptian statues and inscriptions—whether sealed off in crypts or displayed outside temples—were always utilitarian. They invoked spells and charms and ensured admittance to the afterlife (welcomed as a pleasant continuation of one's natural years). In a funerary ceremony known as the "opening of the mouth," priests anointed a statue's lips and nose to allow it to drink, eat, speak and breathe, and thus live forever, once inhabited by the soul of the deceased. Mummies received the same treatment. Despite their art's religious purpose, however, it would be wrong to think the Egyptians had no conception of artistic beauty. New Kingdom visitors to older tombs in several cases scratched graffiti on the walls remarking that what they found was "more beautiful than anything."

Beset by feudal bickering, the Old Kingdom finally crumbled after 500 years. A family from the provincial city of Thebes managed to undercut its rivals and reunify the country around 2000 B.C., inaugurating the Middle Kingdom. The Thebans promoted an obscure local god, Amun (later Amun-Re), to a central spot in the ever-changing Egyptian pantheon. Royal likenesses became more naturalistic and, to the modern eye, more expressive. But the brooding, almost haunted-looking visage of Sesostris III in dark granite (p. 83) may not really express very much about Sesostris the man, in the sense that we look to a modern portrait to reveal a subject's inner self. Sesostris was, after all, a powerful and successful ruler in stable, prosperous times. But literature of the period warned that people could not be trusted and that kingship was a burden. "This was apparently the way it was thought suitable for a king to look in the late Middle Kingdom," says Russmann, "as a ruler who is suffering in order to care for his people."

Made of cartonnage—linen cloth stiffened with plaster—the richly gilded mask (c. 1500 B.C.) boasts attributes of the gods—gold skin, and dark blue hair the color of lapis lazuli.

Fractures in the granite further mar the king's face. The statue once stood outside a Theban temple honoring the Middle Kingdom's founder, Mentuhotep II. Sometime in antiquity it and five almost identical statues were tossed in a heap outside. Varying amounts of damage, in fact, are evident throughout the exhibition—not just gouged eyes but heads cracked from bodies, smashed lips, missing noses. Some of the damage is no doubt due to early methods of col-

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New Kingdom ruler Amenhotep III presented himself as a full-fledged god in human form.

This 3,000-pound quartzite head (c. 1390 B.C.) of the king capped a colossal statue.

lecting. If a seated stone figure, for instance, couldn't be carted off, its head could always be pried free. But other mutilation occurred in ancient times, Russmann says. Rulers pillaged, usurped or remodeled earlier temples and tombs, either to equip their own edifices or to erase a predecessor's memory. Because a statue needed to breathe during the afterlife, its nose was its Achilles' heel, so to speak. "Smashing it was a way to kill the statue and interfere with a person's afterlife," explains Russmann.

Eventually, the Middle Kingdom disintegrated in turn, to be followed, after an interim, by Egypt's glorious 500-year imperial age, the New Kingdom. One of its heroes was the 15th-century king Thutmosis III. A builder of the great temple at Karnak, Thutmosis has sometimes been called the Napoleon of Egypt (his mummy measured only 5 feet 3 inches). Having idled 20 years in the shadow of his imperious stepmother, the renowned woman pharaoh, Queen Hatshepsut, Thutmosis finally assumed the throne and roared into the Near East and across the Euphrates at the head of the Egyptian army, smiting foes. (He also smote every image and mention of his stepmother he could find.)

Powerful queens were exceedingly rare in Egypt. To assert her legitimacy, Hatshepsut sometimes had herself portrayed in a pharaoh's false beard. With a few exceptions, Russmann says, "Women essentially had no public life in ancient Egypt, which has kept us from knowing very much about their lives." Women bought, inherited and bequeathed property and sometimes merited their own tombs. A well-connected woman in the 18th Dynasty named Satdjehuty was high ranking enough to rate her own spectacular mummy mask painted and extravagantly gold-leafed to match the golden skin of the gods.

Couples married by setting up house together, without benefit of religious or civil ceremony. Divorce, too, was rather perfunctory: one or the other moved out, whereupon either could remarry. Women routinely protected their assets before marrying by signing prenuptial agreements. "This is far and above what women could do in any other ancient society we know, including the ancient Greeks," Russmann says.

Nonroyal men had a higher public profile than most women. During the Middle Kingdom, many ordered block statues of themselves. These were stripped-down, almost modern-looking cubes representing a male with arms folded and a modest cloak pulled across his knees. Some match perfectly the pose of Egyptian villagers killing time today, Russmann points out. Such statues were placed in temples or tombs, their flat surfaces filled with prayers, spells and testaments to the subject's piety. Pictures and hieroglyphic writing were deeply intertwined in ancient Egypt. Both had religious meaning. An inscription carved on a statue was thought to enhance its spiritual power. The statue itself was, on a symbolic level, a sort of three-dimensional hieroglyph.

The artist-scribes who created the texts by which all Egypt was ordered—the tallies of sheep and cows, the records of battles fought and taxes due, the prayers to Amun-Re—were powerful men. In a largely illiterate land, literacy was a rare privilege. "Be a scribe," wrote one, "so that your limbs may become sleek, that your hands may become soft, that you may go forth, admired, in white attire and that courtiers may salute you." Scribe school was no picnic, however. One schoolmaster wrote of his teaching philosophy: "The ear of a boy is on his back. He listens when he is beaten."

Skilled artisans occupied a social rung somewhat below scribes. Archaeologists have pieced together a wealth of information from papyri and ostraca (leftover stone chips used as a poor man's papyrus) found in the ancient Theban village of Deir el Medina. The town was full of painters, sculptors, carpenters and other skilled laborers who put in eight-day shifts decorating the rock-cut tombs of the Valley of the Kings. They left behind records of crimes, seductions and the world's first-known strike. (Workers were paid not in money

A powerful Sesostris III presided over stable, prosperous times in the Middle Kingdom.

but in food, drink and other amenities, delivered by slaves. In this case, deliveries were running late.) An eye-opening example of a Theban artist-scribe working in a lively, whimsical style is a scroll (p. 84) depicting animals behaving like humans, possibly as a gibe at the ruling class.

Perhaps the most famous of all Egyptian illustrated texts is the Papyrus of Ani (c. 1200 B.C.), acquired by the British Museum's flamboyant Sir E. A. Wallis Budge at Thebes in 1888. After grabbing the 78-foot scroll in a late-night tomb visit, Budge was placed under house arrest on suspicion of smuggling antiquities. The storehouse where he'd stashed the papyrus and other finds was sealed off, and sentries were posted at the entrance and on the roof. Before the police got around to searching the place, however, Budge arranged for a brigade of villagers to tunnel into the storehouse basement from an adjoining hotel and liberate his treasures.

Of a genre known today as a *Book of the Dead*—a compilation of text and illustrations to help the deceased in the afterlife—such scrolls were often buried with well-to-do citizens. In addition to the usual charms and incantations, Ani's scroll includes meticulously painted scenes of crucial stops on the road to eternity. At the moment of truth, the jackal-headed god Anubis weighs Ani's heart, the seat of intelligence, against a feather symbolizing truth and order, as a jury of mummiform gods looks on. Should his heart fail to balance the feather, the Devourer, a hippo-lion-crocodile hybrid, is poised to gobble it up.

Russmann notes that works like this were not a sign that Egyptians were obsessed with death and dying. These were, rather, a kind of magical passport to a comfortable future. Another aid to the afterlife were *shabtis*—figurines left in tombs to perform whatever manual labor might be asked of the deceased. Taking no chances, kings and nobles sometimes had hundreds of shabtis buried with them.

A centerpiece of the new exhibition is Henry Salt's massive head of Amenhotep III. Amenhotep ruled during the New Kingdom at the height of Egyptian power and built much of the Temple of Luxor. His colossal head was once part of a 26-foot-tall statue, one of ten. Fifty other statues of the king were at least nine feet tall. "You can't help but think there's a certain amount of egomania in all this," Russmann says. Pharaohs until now had always been considered deified men. Amenhotep wanted more, she emphasizes: he presented himself as a full-fledged god in human form. "This statue was meant to be worshiped."

Amenhotep III's upstaging of the old Egyptian gods foreshadowed the heresies of his son, Amenhotep IV, who tried to do away with Amun-Re and the rest altogether. The new king announced that he worshiped only the sun disk, or Aten. He renamed himself Akhenaten and moved the royal court north to Amarna. As part of his revolution, the king and his wife, Nefertiti, were depicted in stat

Sesostris' distinctive features are artfully chiseled in this famous granite statue.

A whimsical scroll penned by an artist-scribe depicts animals behaving like humans.

An antelope and a lion pair up to play a friendly board game in this papyrus with satirical vignettes (c. 1295-1069 B.C.). Many such scenes were done in Thebes during the New Kingdom.

uary and reliefs as shockingly unpharaonic, with thin, elongated noses and chins, thick drooping lips, and slumping, potbellied torsos.

"Scholars keep coming up with new diseases this king must have had," Russmann says, "but in fact his chief sculptor early in his reign, when the style was most exaggerated, left an inscription that said, 'The king told me how to do this.'" The young pharaoh evidently thought an unorthodox official image would help sell his unorthodox theology. After his death, Akhenaten's successors branded him a heretic and had most of his statues smashed.

A century later, a 19th-Dynasty king, Sety II, was portrayed in sandstone with the well-toned musculature and erect posture of the Old Kingdom pharoahs, and no hint of a slouch. The statue's near-pristine condition is a tribute to another well-conditioned man, Giovanni-Battista Belzoni, who found it in 1816. A one-time carnival strongman, Belzoni was renowned for hauling colossi overland with a small army of laborers for shipment on to London. His own bulk was sometimes a liability. In his memoirs, Belzoni described losing his balance while squeezing through a tomb passageway, and toppling onto a pile of desiccated mummies.

Though Egypt's imperial power would soon decline, the New Kingdom's 18th and 19th Dynasties were a time of lavish spending, public and private. Ramses the Great (1279-1213 B.C.) built the great temple at Abu Simbel. The society's elite enjoyed an affluence the world had never seen before. Its fashion principle, says Russmann, was "more is better." Men and women now wrapped themselves in elaborately pleated layers of starched linen, and even the men took to wearing earrings and anklets. Sculptures from this period include a basalt bust of a young woman with a braided, tasseled wig and a beaded pectoral the size of a small millstone, and a custom-made luxury item of the day: a wooden cosmetic box in the form of a chubby young servant carrying a chest on her head.

Cosmetics had long been a staple of Egyptian life—their absence as payment in kind was a chief grievance in the Deir el Medina strike. Cosmetics were more than a beauty aid. Men used them as a sunscreen and skin lubricant. Both men and women painted their faces from brow to nose in green and, later, black paint, in part to mimic the protective eye of the god Horus. For special occasions, they would wear greasy cones of perfumed ointment on their heads. As a banquet warmed up, the fragrant cones would ooze down into their wigs.

Soon after Ramses the Great, Egypt entered into a long limbo of weak kings, invasions and occasional foreign rule. A string of Macedonian kings, the Ptolemies, ruled Egypt following the arrival of Alexander the Great in the fourth century B.C. In an unfinished granite statue of one of these kings, a fleshy, pouting Hellenistic face tops a traditional Egyptian body. "He was presenting himself as an Egyptian pharaoh," says Russmann. "This was absolutely necessary in order to rule Egypt. You had to slot yourself into the divine pantheon."

Nonroyal statuary of the Ptolemaic Period often shows a similar mismatch of head and body. "It was Roman portraiture that many 19th-century collectors were interested in," says Russmann. "The Egyptian-style torsos detracted from that." Some dealers of the day obliged by cracking off the heads and ditching the bodies.

Art lovers are more enlightened today, owing to a vastly heightened interest in the epic sweep of Egyptian civilization. Through the endless rise and fall of dynasties, Egypt remained at heart the land of pharaohs ruling with left foot forward. Thanks to the disciplined creativity of its artists, generation after generation, the grandeur of Egypt can still astonish us today, as it must have astonished the world in the days of Thutmosis and Ramses.

The author's most recent art story for this magazine took a look at Orientalism.

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ACROSS THE RUSSIAN

Wilds

PHOTOGRAPHS BY IGOR SHPILENOK AND LAURA WILLIAMS

STARTING AT THE SHORE OF THE deepest lake on earth, in the heart of Siberia, we clamber upward. Picking our way over sharp scree and buttery reindeer moss (right), we pass cowberries beloved by bears, trees shredded by bears and mauled elk-parts left by bears.

After nearly a vertical mile of climbing, we look down on ancient Lake Baikal, home to hundreds of aquatic animals found nowhere else. We stand atop a vast nature reserve, twice the size of Rhode Island, called Baikal-Lena—part of a system of reserves that arcs around more than two-fifths of the Northern Hemisphere. Few have approached within miles of this place. Like most Russian reserves, Baikal-Lena generally forbids intrusion except for research.

ROUGHING IT 5,000 MILES, THE AUTHOR AND HIS COMPANIONS WENT PLACES FEW RUSSIANS EVER SEE

Because traditionally they are open only to scientists and staff, Russia's refuges, known as *Zapovedniki*, remain one of the country's best-kept secrets, even from the Russians themselves. Recently, however, our three-person team was permitted to visit a continent-wide cross section. Stretching from Europe to the Pacific coast of Asia, the stunning landscapes we saw are as diverse as the system that

BY FRED STREBEIGH

inspired their creation: America's national parks.

Russian naturalists in the early 1900s, aware that Uncle Sam had begun creating parks to serve people (to offer man a "pleasuring ground," said our Yellowstone Act of 1872), proposed an alternative: creating parks to conserve nature. In these wildlands, one of the founders of Russia's nature protection movement declared in 1908, "Nature must be left alone."

Russia's 100 reserves now cover almost 83 million acres, nearly matching the grand scale of America's national park system, and they have achieved worldwide distinction. Russia devotes more land than any other country to what the World Conservation Union (formerly known as the International Union for Conservation of Nature, or IUCN) calls "strict nature reserves," areas devoted mainly to science.

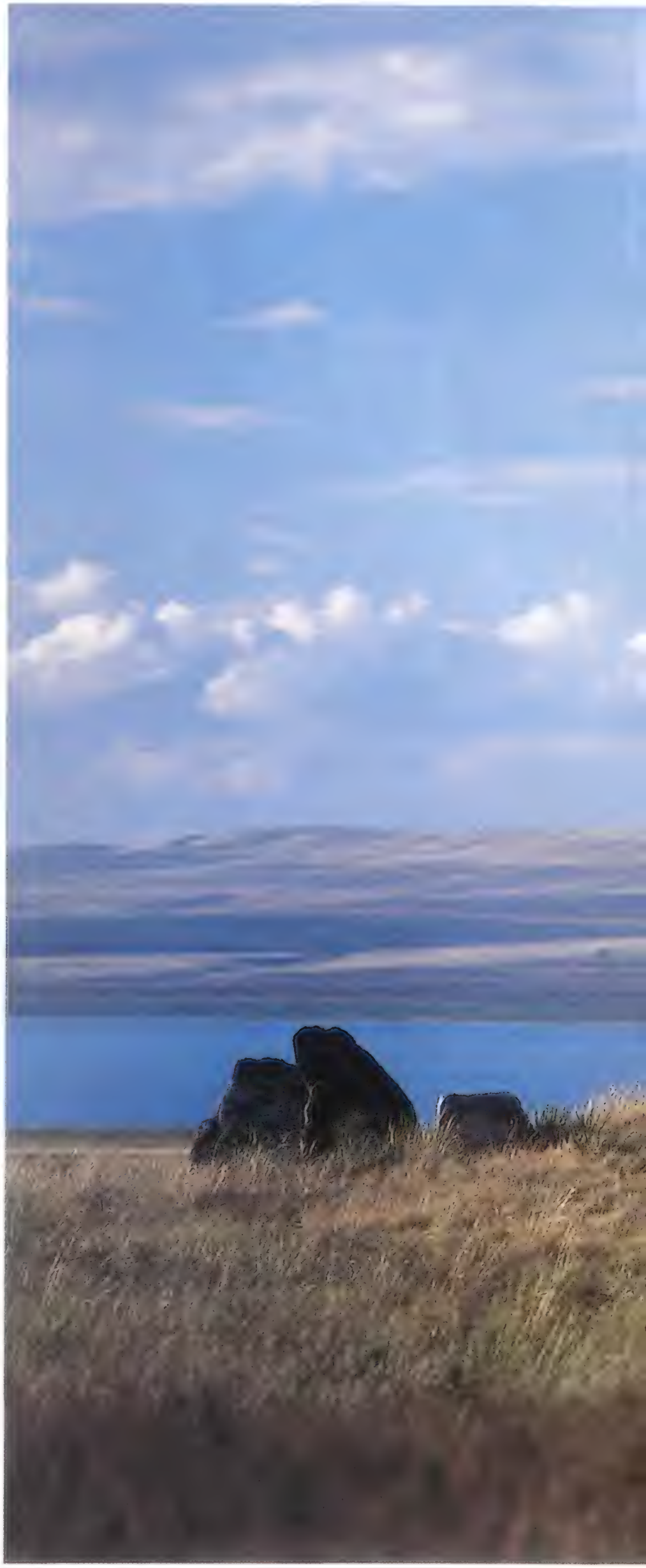
As the photographs on these pages show, the reserves combine beauty and remoteness. To explore them, we forded fast-moving rivers on horseback. We hid beneath white sheets to watch the downy chicks of rare Siberian cranes feed at the edge of broad floodplains. Using ropes of braided rawhide, we climbed pine

The Kuril Nature Reserve showcases volcanoes dead and alive. Reflective mineral waters in Boiling Lake (left) are heated by an active core. Cracked basalt (above) is all that remains of an ancient cone. Birches thrive amid lush bamboo (below) on rich volcanic soil.

trees with bee researchers in the Ural Mountains. Motoring by patrol ship, we traveled the broad Yenisey River to a snow leopard research camp just north of Mongolia. Rowing an overloaded boat, we crossed oxbow lakes above the Amur River, where it marks the border with China. As we made our way across 5,000 miles, we kept hearing one question: Would the reserves' traditional isolation lead to their modern downfall?

What pictures cannot show is how hard Russia's naturalists must struggle to protect these supposedly inviolate lands from the miners, poachers and loggers who are bent on slicing into them. Such battles differ little from others being waged elsewhere around the globe, except perhaps in two respects. First, at mid-century,

Snow plasters an alder swamp (left) at the Bryansk Forest Nature Reserve. In balmy weather, sunlight burnishes meadow grasses (right). Bryansk Forest nurtures everything from meaty orange-cap boletus mushrooms (below, left) to unflappable-looking tawny owls.



Russia's despoilers of nature included Soviet leaders Joseph Stalin and Nikita Khrushchev, both of whom attacked the reserves. Widespread Soviet ravaging of the environment over the years has been described as ecocide. Second, for the past decade Russia's turn to democracy has also been a turn to even greater poverty. The reserves' budget has fallen drastically. Government funding for all of them in 2000, $5.2 million, would run America's National Park Service for less than two days. A director of science works for $560 a year, a ranger for about $250. Such wages can make someone wonder: Does anyone value what I do?

We spent the last days of our six-week journey at a volcanic reserve in the Kuril Islands, in the Pacific's Ring of Fire. There, we learned how gold miners and poachers were using an amphibious assault vehicle to wreak havoc on

A lotus flower (above) unfolds its elegant blossom at the Khingan Nature Reserve, where this member of the water-lily family is being restored. Khingan is located just north of the Amur River, which separates Russia and China. Stone markers denote ancient burial mounds at the Khakasia Nature Reserve (right), which protects remnants of a southern Siberian steppe.

Clouds caress the rugged mountains that surround Lake Baikal (above), which is notorious for violent winds and unpredictable weather. Cowberries (right), a favorite food of bears, thrive near Baikal and elsewhere throughout Russia.

streams and fragile volcanic soil, and we heard yet another version of the 5,000-mile question.

Our companion was a young naturalist. Early in our stay, she had led us barefoot through a warm lake in the lush caldera of a volcano, where she had gathered plants for a botanical garden. As we prepared to leave, she raised an issue that was on all of our minds: clearly Russia's reserves are at a crossroads. Now that the people have the freedom to choose, will they continue to safeguard wildlands that must remain forever beyond their reach? After seeing for ourselves how much is at stake, the three of us could only hope the answer will be yes.

Igor Shpilenok and Laura Williams live in the Bryansk Forest Nature Reserve in western Russia. They are photographers and editors for the English-language Website on Russia's nature reserve system: www.wild-russia.org. Fred Strebeigh teaches writing at the Yale School of Forestry and Environmental Studies.

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Volendam passengers crowd the rail in Glacier Bay National Park.

Smithsonian Journeys

CRUISE TO Alaska

VISITING THE 49TH STATE BY SEA MEANS YOU'RE IN FOR SCENIC GRANDEUR AND GRAND HOTEL COMFORT ◆ BY MICHAEL PARFIT

Hans van Biljouw, the captain of the motor ship *Volendam*, is as jolly as Santa Claus, but even he goes quiet as the big ship heads toward Snow Passage in darkness and fog.

"It's only about two cables wide there," he says quietly as he stands on the bridge, watching the pilot give instructions to the man at the helm. A cable measures 608 feet. The *Volendam* is 106 feet wide and 780 feet long. At 60,906 tons it is considerably bigger than the ship that was once the symbolic apex of technology, the *Titanic*. But it is going to go through a very small place.

PHOTOGRAPHS BY ERIC SANDER

We chose to take a seven-day cruise to Alaska because that's one of the most popular single venues in the industry.

Snow Passage is a pinch of deep water between rocks, a gap among islands in Southeast Alaska's Inside Passage. Here, wind-whipped tides can build seas big enough to capsize small boats and currents strong enough to drive big ships aground. But though the radar screen shows rock closing in on each side, we can't see anything out the slanted windows of the bridge but black fog.

"Did the *Dawn Princess* say anything about fog when she went through here?" Captain van Biljouw asks the pilot. The answer is no. The captain says nothing. Everyone is silent.

The big Holland America Line ship shudders with power. It is racing at its target like an arrow shot at a keyhole. All five of its huge diesel engines roar, pouring out 43 megawatts, enough power for a city of 44,500. Its two electric propulsion motors are using 26 of those megawatts to drive the ship. The ship is going almost full speed—22 knots (about 25 miles per hour)—trying to get to the pass while the tide turns, to avoid dangerous currents. But except for the hum of electronic equipment on the bridge and the occasional blast of the ship's horn as a warning to anyone else moving in the fog, there is no sound. Eight people stare out at the night, and wait.

Almost no one else on the ship knows what is going on. It is shortly before 5 A.M. All but a few of the 1,479 passengers are asleep. They have no idea of the

Holland America Line's *Volendam* looms over the foot of Broadway, in Skagway, Alaska. Mountain-girded Skagway gained fame during the chaotic Klondike gold stampede of 1897-1899. Today the town finds gold in its flourishing cruise-ship-fed tourism industry.

tension on the bridge, and they will never learn of it. That protection is part of the package. The huge business of cruising, one of the fastest-growing pieces of the booming travel industry, is built on the intricate elaboration of the illusion that, for a week or two at least, complete comfort and security can be had on earth.

I am on board with my wife, Suzanne. We're on a cruise from Vancouver, British Columbia, to Glacier Bay, Alaska, and back. We chose to take a seven-day cruise to Alaska because that's one of the most popular single venues in the industry. Every year more than half a million tourists take cruise ships through the Inside Passage. We're here on an unusual assignment, which is both delightful and unsettling: to revel in the illusion and to look behind it. The story begins, like every ship, with the cutting of steel.

In the Kvaerner Masa-Yards in Turku, Finland, an enormous crane lifts the bridge of the 137,300-ton Royal Caribbean ship *Voyager of the Seas*. Next it will swing it into position to be welded into the ship's structure. The entire vessel was built of such huge preassembled blocks.

JOUNI SAARISTO/KVAERNER MASA-YARDS, TURKU

In a vast building in Turku, Finland, a pond was burning. The pond was a tank about 2,500 square feet. Deep in the tank intense blue fire danced, and streams of silver bubbles rose to the surface, where they burst into smoke and steam that was whisked away by fans. The pond looked as if it were burning because steel plates two-thirds of an inch thick were being cut underwater by computer-controlled plasma cutting devices. This was the beginning of a cruise ship.

Turku is the home of one of two shipbuilding facilities owned by Kvaerner Masa-Yards. It is one of the few shipyards in the world where big cruise ships are built, though the *Volendam*, it happens, was not built there. I was there to look at the genesis of all this luxury. There, in the steel-cutting rooms, were the plates for a ship that will eventually be one of the biggest cruise liners.

"The first cruise designs were based on ferries," said Kaj Liljestrand, a naval architect and executive vice president of Kvaerner Masa-Yards. "At that time the perception was that only retired people were cruising. It was considered boring for young people."

Kvaerner Masa-Yards' first large cruise ship, built for Royal Caribbean, was called *Song of Norway* and was launched in 1969. It was an 18,416-ton ship, big for its day. (In the world of shipping, a ton in this case means 100 cubic feet of enclosed space.) It originally carried 880 passengers

At that time, about half a million people went to sea on cruises every year. But today the industry has grown to some 250 operating ships. It serves about 10 million people a year and generates an estimated annual gross revenue of $13 billion Since 1980 the North American cruise industry has grown by an average of 8.4 percent per year, but that seems to be accelerating: in 2000 alone there was a 16 percent increase in the number of passengers over 1999.

Today's boom is credited to many things, from the television series *The Love Boat*, which originally ran from 1977 to 1986, to the increased capacity on cruise ships. Other reasons cited are that the baby boomers are getting older and that people have more disposable income; that more younger people are interested in leisure and that cruising is simply one of the least stressful vacations around. "All you have to do is show up," one frequent passenger told me. "They do all the

Decorated with a "Renaissance/modern" theme, the *Volendam*'s two-deck Rotterdam dining room seats 747 passengers at assigned tables. Other onboard restaurants and cafés offer more flexibility for diners who want to choose their own company or eat less formally.

rest." As a result, cruises have become one of the most profitable parts of the travel industry. This has led to a boom in cruise-ship building. And, because cruise passengers seem to make more demands as they grow in number, the boom has led to all sorts of innovations.

The progression of these demands is represented in a chart of "Musts and Wants" that Liljestrand and several others at Kvaerner Masa-Yards showed me. In the 1970s people required only one thing of the ships they boarded: safety. They wanted value for their money. In the early 1980s they needed safety and reliability; they also started to think about what Kvaerner Masa calls "special attractions"—things like Las Vegas-style shows, and fitness centers. In the 1990s the needs list grew to include "environmental friendliness," and people also wanted "impressive design." Now the wants list has grown to include multiple choices of things to do or places to eat on board, and at the top, the idea that a cruise should be a unique experience.

"We've studied everything from submarines to airships," Liljestrand said, "and anything in between that floats." The result is ships that are even more elegant and far more varied in their attractions than the *Titanic*.

For me, however, as for most people, the first impression of the ship was its size. Out on the upper decks we were ten stories above the water. Down among the cabins, several decks of halls stretched away into a distant haze of identical doors, like halls of mirrors.

Suzanne and I had boarded this ship in Canada because of a U.S. law that forbids a ship such as the *Volendam*, which wasn't built in the United States and isn't owned and crewed by Americans, from picking passengers up in one U.S. port and dropping them off in another.

As the ship motored northwest between Vancouver Island and the British Co-

Cruising is simply one of the least stressful vacations around. "All you have to do is show up. They do all the rest."

lumbia mainland, the landscape became wilder: a few fishing boats, a couple of tiny logging towns, an Indian reserve on an island.

I woke early and went out onto the deck, all but alone at 6 A.M. The air was cold. Wraiths of moonlit cloud draped the forested shoulders of mountains. I leaned on the rail looking out at the rugged world sliding past and thought again about Finland.

The yard by the office of the Kvaerner Masa-Yards in Helsinki looked as if it had been hit by some bizarre kind of earthquake that scattered chunks of apartment buildings all over the place. The chunks were pieces of cruise ships, called blocks, each several stories high. Men clambered over them, installing pipes and cable tracks, before the blocks were welded together to make a ship. "It's like Lego pieces," said Henrik Segercrantz, also a naval architect, who was my guide. "This is how we build ships."

Those blocks can sometimes weigh more than 400 tons each. A cruise ship is made out of some 100 of them. Air-conditioning ducts, insulation, machinery and even stairways are installed in blocks before trucks larger than train cars carry them to a vast indoor dry dock and overhead cranes lift them into place. When I watched one being installed on a ship, it was impossible to imagine that this was the beginning of luxury.

Outside, however, luxury was waiting in plastic-wrapped boxes. The boxes were staterooms, manufactured in a nearby plant and trucked here. They would be popped into the blocks when the blocks were ready. To me these boxes sitting on the dock were a testament to the extraordinary precision of modern engineering. The builders of the boxes had absolute faith that the slots they were going into were all going to be the right size. As they waited on the dock, the nearly completed staterooms already had mirrors on the walls, and there were hair dryers in the drawers.

In their designs, Kvaerner Masa-Yards architects try to give balconies to as many of the staterooms as possible. They have managed to design and build two cruise ships in which as many as 70 percent of the staterooms have a little porch overlooking the water.

We did not have a balcony, but the outside deck was a fine, breezy place to be as the *Volendam* started up the Inside Passage to Alaska. It's a labyrinthine path through an archipelago clothed in inscrutable forests of western hemlock and Sitka spruce. The ship turned left at the end of Vancouver Island and then headed north among those woods in mist, and the forests seemed as silent and full of secrets as time itself.

That night we ate a typical meal of Alaska king crab legs, salad, baked stuffed prawns Del Rey on spinach fettuccine, and chocolate cake with our assigned tablemates: Michelle and Rob Rone, from Texas, and Randal and Jan

***Volendam* passengers Randal and Jan Hundley pose for their picture with the captain, Hans van Biljouw. Cruise enthusiasts from Arkansas, the Hundleys enjoyed Alaska's opportunities for hiking and whale-watching, and sightseeing from the deck of their mobile hotel.**

"On these ships," said Captain van Biljouw, "when you ask for the power, you have the power."

Hundley, from Arkansas. Rob, a tall, young salesman, said they'd gone on the cruise because "I like to be pampered." Randal, a wry and cheerful cardiologist, had bid on the trip on the spur of the moment at an art center benefit auction. "We always wanted to go to Alaska," he said.

In the past, meals on cruise ships were usually set up as ours were: you were assigned to a table with a few other passengers. It forced socialization and was easier for the cooks. That's all changing. "Choices" is a catchword in cruise marketing. On the *Volendam* you can also dine at a cafeteria on the Lido Deck or make a reservation at a more intimate restaurant called the Marco Polo. On other ships, even more dining options are offered, and some have developed marketing relationships with onshore restaurant chains.

Recreational choices, too, have come a long way from shuffleboard. Now there are huge fitness centers and spas where you can buy a massage, a seaweed wrap or a course of therapeutic vitamins. There are also multiple swimming pools, jogging tracks, paddle-tennis courts, miniature golf courses, video-game parlors, art auctions, first-run movies, karaoke machines and—on the biggest ships—ice skating rinks and rock climbing walls.

Some of the real advances in cruise liners, however, are not visible to passengers. These are technical developments so fundamental and innovative that people and designers from all over the world, including the United States, have visited Kvaerner Masa-Yards to check them out.

This innovation comes in two parts. First, most new cruise liners are what are called "diesel-electric ships." This means that instead of running propeller shafts directly, via a reduction gear, from the enormous diesel engines, the shafts are connected to electric motors that get their power from diesel-driven power plants. These plants, not much different from generating stations onshore, just provide electricity, and it's up to switches whether the power goes to propulsion or services. This allows flexibility in the amount of power generated, as well as in things like choosing whether to make the ship cooler or make it go faster, and in deciding where to put the engines to provide the best balance and the most living space. "On these ships," said Captain van Biljouw, "when you ask for the power, you have the power."

Volendam engineers Pieter Rodenrijs, foreground, and Rinaldo Verhoeven stand watch in the ship's engine control room, located midships on A Deck. Here in the vessel's nerve center for equipment and propulsion, engineers monitor all systems and take action on any alarms.

The second innovation, which derives from the first, is a revolutionary idea called the Azipod. This is a huge thing that looks almost exactly like the little motor and propeller combination on the end of an electric outboard trolling motor, except for two things: first, an Azipod weighs 200 tons and is bolted on under the ship; second, instead of pointing aft, as on an outboard, the propeller on the Azipod usually faces forward, as on an aircraft engine.

Because an Azipod can turn a full 360 degrees on its mount, it does away with rudders, which means less drag and far

greater maneuverability—all of which equals more efficiency. It can save up to 10 percent of the hundred tons of fuel or more that a midsize cruise ship burns each day.

Innovations like rotating Azipods, which the *Volendam* doesn't have, and powerful side thrusters built into bow and stern, which the *Volendam* does have, make these cruise liners so maneuverable that a ship can pull up beside a dock and just sidle into place. On the *Volendam* bridge one day, when we were docking, I heard Captain van Biljouw tell his bridge crew: "One meter ahead." The ship was moved one meter. The captain chortled. He turned to me and said, "Piece of cake."

On a typical seven-day cruise, *Volendam* chefs serve up 22,000 pounds of fresh vegetables, 12,000 pounds of fruit, 8,000 pounds of beef, 3,000 pounds of poultry, 4,000 pounds of fish, 1,250 pounds of pork, 500 pounds of lobster, 20 pounds of caviar, 500 pounds of coffee, 35,000 eggs and much, much more.

Azipods and side thrusters, plus advances in electronics, have led to what seems to me a marvelous technological irony. The largest ships in the fleet, the 140,000-ton *Voyager*-class ships Kvaerner Masa-Yards is building for Royal Caribbean, can be entirely controlled on the bridge by a single joystick that is far less impressive than the one I use to blast aliens on my home computer.

One of the docks the *Volendam* sidled up to was the first port of call: Juneau, Alaska. There was only one other cruise ship in port. That was unusual. In the peak of summer there are often more—sometimes as many as five at a time.

The number of ships has led to a common cruise ship–port of destination conflict. Juneau is Alaska's capital, but it's a small town of roughly 30,000 people. When several thousand tourists rush ashore each summer day, intent on getting something Alaskan out of a nine-hour visit, they have an impact. They have changed the waterfront into a froth of jewelry and trinket shops, and have filled the skies with helicopters. Cruise ship passengers are offered long menus of things to do onshore, and helicopter rides to glaciers are among the most popular. About 35 helicopters are based in Juneau all summer. To help pay to mitigate cruise ship impact, the city of Juneau recently passed an ordinance imposing a fee on cruise lines of $5 for every passenger they bring to town.

That may be just the beginning. Alaska's governor, Tony Knowles, has been calling attention to discharge of polluted wastewater by cruise ships in Southeast Alaska. A report summary on tests paid for by the cruise industry and conducted in Alaska last year on the outflows of 21 large cruise ships stated that the ships' marine sanitation devices "are not working well at producing an effluent that meets the standards set by EPA."

Pollution in general has been a stain on the cruise industry. A number of cruise lines have pleaded guilty to charges of dumping oil or garbage against regulations.

Aware that their clientele is sensitive to environmental issues, cruise lines are making efforts to look very green. In spite of the complaints from Alaska, recycling and sewage control equipment on modern ships is more rigorous than in some coastal cities. On the *Volendam*, some of the efforts were vivid.

One morning when I went to the deserted Lido Deck at six, I saw a crewman hosing it down. I thought he was sloshing the debris of the previous day's party over the side, but I was wrong. In the scuppers were small traps that caught bits of food and plastic. When he was finished hosing, the crewman scooped hand-

Glacier Bay is one of the biggest national parks in the United States. And 85 percent of the visitors come on cruise ships.

fuls of trash out of the traps and put them in a bucket. "If he'd put anything over the side, anything," Frits Gehner, the ship's hotel manager, said later, "he would have faced severe disciplinary action."

As the ship moved north, the days lengthened. "In Alaska," the captain said happily, "you have to sleep fast." People started to get into little habits. Jan and Randal Hundley ran on the treadmills every morning and could usually be found in the Java Cafe about two in the afternoon.

In Skagway the weather held fine and there were more shore excursions. The Rones rode bicycles on the hillside roads above the trail where gold miners had struggled on their way to Dawson City in the Yukon in the late 1890s. We took a train up the old White Pass & Yukon railroad line to the Canadian border and back, and met a group of six women from Florida and New York, who were traveling on the *Volendam* without their husbands and were having a great time, except for one thing. "I haven't seen many whales," said one of them.

The next day, still sunny, saw the journey's highlight, Glacier Bay National Park and Preserve, just northwest of Juneau. "Put on all the clothes you brought with you," said a woman's voice on loudspeakers throughout the ship, "and come on outside and see and feel and hear this ice." The voice was of a National Park Service naturalist named Dena Matkin. The ice was the sheer and craggy face of the Johns Hopkins Glacier.

Glacier Bay is one of the largest national parks in the United States. With 3.2 million acres it's a million larger than Yellowstone. But it has only 400,000 visitors a year compared with Yellowstone's 3.1 million. And 85 percent of the visitors to Glacier Bay come by cruise ship.

For a fee, the U.S. National Park Service brings naturalists to the ships. Ours boarded in the morning and took over the ship's microphone. The naturalists, who were clearly in love with their stunning park, had a little game to ease the monotony of saying the same things day after day. They bet Matkin, who had the day's public address chores, that she wouldn't be able to include in her narration words that aren't normally part of a naturalist's talk. Today the words were "acrimonious" and "filibuster." Matkin grimaced. Filibuster?

The ship moved slowly into an area sprinkled with icebergs and edged by the wall of ice. We were at the head of the Johns Hopkins Inlet, where the glacier meets the deep water.

Then something I did not expect happened. Hundreds of passengers emerged onto the forward decks, which faced the ice. Many wore tartan deck blankets wrapped around their shoulders to ward off the chill. They stood there watching the glacier where it had carved away the side of a hill. "There,"

The Mt. Fairweather Dance Group of Hoonah, Alaska, sings and dances in traditional ceremonial clothing for *Volendam* passengers. The dancers preserve Huna Indian culture and heritage, using these demonstrations to make their past and present come alive for onlookers.

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Veterans of several cruises, Texans Michelle and Rob Rone looked for luxury and extravagance as part of the romance of a sea voyage. The ship also brought them close views of bald eagles and other wildlife, an unexpected bonus.

said Dena Matkin on the loudspeaker, "you can see the acrimonious relationship between ice and rock."

The ship was about a quarter of a mile from the ice front. Crew members worked their way quietly among the passengers, handing out cups of Dutch pea soup. Once in a while the glacier gave off a crack like the shot of a rifle. Less often a small piece of ice calved off its face and kicked up a small wave. Streaks of sunlight touched distant ridges. Two bald eagles landed on a chunk of ice near the bow of the ship and appeared to be sharing a fish. But other than that almost nothing moved. Yet the people watched, rapt. For 15 minutes, 30 minutes, an hour.

I wandered among the passengers. Randal and Jan Hundley were there on one of the higher decks, just watching. So, it seemed, was almost everyone else. When a small piece of ice bumped against the hull and I heard its faint clang, I realized that everyone was being intentionally quiet. No voices were raised. People murmured to each other. It was as if the people of the *Volendam* had suddenly become aware of the world that exists apart from them, and they were in awe. As we left Glacier Bay, the loudspeakers came on again, and Dena Matkin won her bet. "I can't filibuster you anymore," she said.

That night a group of Tlingit dancers came on board from a nearby village and gave a demonstration of their cultural traditions. It was rough around the edges, but as authentic as the ice. The huge crowd in the theater loved it. But then we unloaded the naturalists and the dancers and turned for home. We would stop once more, at Ketchikan, where the weather was still so good that the bright little town looked Mediterranean.

Even Snow Passage turned out to be an anticlimax. The fog lifted just as we swept past the rocks at 14 knots, and the captain said, "That is the magic of the power of a captain, to make the fog lift." The fog closed back down.

Near the end of the trip, as the ship moved through quiet waters next to Vancouver Island, the crew conducted a ritual in the dining room that is common to many cruises. With great ceremony, they carried in Baked Alaska desserts festooned with sparklers.

A number of recent news stories about working conditions on some cruise ships have brought controversy to the lower decks. The registration of vessels to "flag of convenience" countries like Liberia and Panama allows cruise companies to avoid both some taxes and laws relating to crew welfare. So crew members recruited from developing nations where pay scales are very low are often asked to work long hours for very little money. However, crews have recently become more organized, and now about 60 percent of the cruise lines have signed agreements with the International Transport Workers Federation, which represents 600,000 sailors and other seafaring workers worldwide. These agreements have improved wages, living conditions and medical coverage, and they let passengers feel better about conditions for the people who serve them. Holland America is one of those companies, which may be one reason why our cabin steward and waiters seemed particularly cheerful in their work.

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A cruise ship is like that perfect small town where you wish you had grown up, where the cookie jar is always open.

The *Volendam* raced at full speed back down the coast of Vancouver Island in order to get through another tight spot called Seymour Narrows at slack water, when there is minimum current. Then, ahead of schedule, the ship coasted the last hundred miles at five knots. It was still sunny. We disembarked in a flurry of bags and good-byes. The next day we took a ferry to Victoria. As we got off the ferry, we saw people we knew. It was the group of six enthusiastic women without their husbands from New York and Florida. They had gone across to Victoria to watch whales.

We had only known them a few days, but we laughed and hugged. "We saw lots of whales," said one of them. Suddenly we were nostalgic, and I realized that the illusion that cruising gives you is not just of comfort and serenity but of community. A cruise ship is like that perfect small town where you wish you had grown up, where the cookie jars were always open, everyone liked you and the authority figures did just what you asked.

In Finland, cold winds swirled the sky with cloud. With Henrik Segercrantz, I went on board today's pride of the cruising industry. It was the 137,300-ton *Explorer of the Seas*. Now in service, she carries more than 3,000 passengers and 1,000 crew. More than 50 new cruise ships will be launched in the next few years. One of them will be even larger: the *Queen Mary 2*, scheduled to launch in 2003, will be 150,000 tons, and will be able to cruise at 30 knots—7 knots faster than our *Volendam*. Though not all cruise ships are big—a whole niche exists for smaller vessels dedicated to adventure trips or local voyages—an end to growth at the large end is not in sight. "There is always something you must have in the back pocket for the next generation," said Kaj Liljestrand. "If you ask me will there be bigger ships, I would say yes. Why should they stop?"

Michael Parfit has written for Smithsonian *for more than 20 years on subjects from the Mississippi River (February 1993) to crop dusting (May 2000). Eric Sander's photographs last appeared in our story on wind sculpture in August 2000.*

Does a trip to America's last frontier sound appealing?

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THESE ISLANDS CALM the waves of the Pacific Ocean and make for smooth sailing, an ideal introduction for landlubbers nervous about their sea legs. Whereas writer Michael Parfit and his wife, Suzanne Chisholm, voyaged aboard Holland America's 60,906-ton MS *Volendam* (1-800-426-0327 or hollandamerica.com), other cruise companies (Cruise Web, 1-800-377-9383 or cruiseweb.com) also offer trips along the Alaskan coast. Many cruises explore Glacier Bay National Park, which contains 12 tidewater glaciers, rookeries, whales, and icebergs on which seals often bask. Also, many make stops in Ketchikan, a small town where three Northwest Coast Indian cultures converge and totem poles dot the landscape, and Skagway, home of the Klondike Gold Rush National Historical Park. (Check out the six-foot-long map contained within *Alaska & Canada's Inside Passage Cruise Tour Guide* by George King and Karin Hasselberg, $12.95, Paradise Cay Publications.)

WE'RE BETTING THAT, like John Muir, you'll have a tough time putting the cruise experience of Alaska's Inside Passage into words. For lots more information, essays and travel tips about cruising, visit our new travel Website at **smithsonianmag.com/journeys.**

ELIZABETH WOLF

One billion people. One thousand languages.

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Dr. Franklin's Plan

ON A SUNDAY IN LATE OCTOBER 1776, SEVENTY-YEAR-OLD Benjamin Franklin sailed for France in the American 16-gun sloop *Reprisal* to take up his duties as one of his new nation's commissioners to the Court of Versailles. He did so in the certain knowledge that if *Reprisal* was taken by a British warship, he would be hanged for high treason. His signature was on the inflammatory Declaration of Independence, a document he had just helped craft.

Franklin had been home in Philadelphia barely a year and a half after spending almost two decades representing first Pennsylvania and, eventually, several colonies at the court of King George II of England, and when the king died, his son George III. The experience had made him more familiar with the ways of Europe than anyone else in the new American government. The only way the war for independence was going to work was if the French helped fund it. It would be his task to squeeze from the most autocratic monarch in Europe the money to pay for a democratic revolution. He had no idea as he sailed that the task would keep him in France for almost ten years. His ultimate success in securing the assistance of the French, aid that would result in the capitulation of the British forces under Gen. Lord Cornwallis at Yorktown, Virginia, in 1781, would culminate with his negotiation of the Treaty of Paris, confirming the existence of the United States.

When he arrived in France, he was arguably the most famous man in the European sphere. Fashionable women wore bracelets and rings set with his profile. John Adams, who worked with Franklin in France, wrote of that time some years later, saying, "there was scarcely a peasant or a citizen, a *valet de chambre*, coachman or footman, a lady's chambermaid or a scullion in a kitchen, who was not familiar with [Franklin's name], and who did not consider him as a friend to human kind."

To this popular acclaim was added the weight of recognized scientific genius, and this and his friendships among the aristocracy of intellect in Europe gave him a potent network. Coupled with an understanding of how to sway public opinion that was centuries ahead of its time, such connections and fame made Franklin a formidable proponent and adversary. And he was impervious to flanking character attacks. Warned of being spied on (as he was throughout the war), he replied, "I have long observ'd one Rule which prevents any Inconvenience from such Practices. It is simply this, to be concern'd in no Affairs that I should blush to have made publick, and to do nothing but what Spies may see & welcome."

THIS PRINTER, SCIENTIST AND AMBASSADOR EARLY FORMED A PLAN FOR HIMSELF—AND FOR THE COUNTRY HE HELPED FOUND

◆ BY STEPHAN A. SCHWARTZ

His modest dress and workman's background, together with his benign and quiet manner, were deceptive to those used to grand gestures and obfuscating talk. "I served," Jefferson would say much later, "with General Washington in the legislature of Virginia before the Revolution, and during it with Dr. Franklin in Congress. I never heard either of them speak ten minutes at a time, nor to any but the main point which was to decide the question. They laid their shoulders to the great points, knowing that the little ones would follow of themselves."

Franklin came late to the idea of independence, but early to the colonies as a distinct union. Once he had embraced independence, he had passionately held to a clear vision of the kind of country he wanted it to be: a democratic republic whose political power flowed from its citizens. To build such a society he had many years before devised a

Dated 1789, this portrait of Benjamin Franklin is by Philadelphian Charles Wilson Peale, who shared his subject's interest in science.

plan with three simple, practical steps: the creation of "virtuous" citizens, the formation of small groups with a common purpose and commitment to the collective good, and the establishment of networks that grew from these groups. "I have always thought," he once wrote, "that one Man of tolerable Abilities may work great Changes, and accomplish great Affairs among Mankind, if he first forms a good Plan, and . . . makes the Execution of that same Plan his sole Study and Business."

As early as 1751 he had outlined how a union of the colonies might be achieved. Three years later, he wrote the Albany Plan of Union during a conference called to conclude a treaty with the Six Nations, a long-enduring confederation of the Mohawk, Oneida, Onondaga, Cayuga, Seneca and Tuscarora tribes. In this document and in three subsequent letters, Franklin presented arguments that would define the War of Independence 20 years before it happened.

No other Founder even came close to Franklin's direct level of familiarity with the cultures, beliefs and byways of the diverse and contradictory land and people that would become the United States of America. When, in 1753, he was made deputy postmaster general of North America, he took up the appointment with delight. In an age when travel was difficult, problematic, frequently uncomfortable and sometimes dangerous, he loved it. He rode well, loved good food—although he would eat anything put before him—and was wonderful company. A compulsive scientist, insatiably curious, he could not cross an ocean without measuring currents, could not look at a stream without considering the fish that swam within, nor ride a horse without considering horse, weather and the species of tree they both might find shelter beneath.

A crowd gathers at Philadelphia's Market Street wharf to greet Franklin on his return from France in 1785, after he had signed the treaty that ended the American Revolution.

His *Poor Richard's Almanack*, pamphlets and newspapers had molded public opinion for decades by the time he sailed for France. His work to establish a hospital, an insurance company, fire companies, libraries, learned societies, a college, sanitation programs and police departments had transformed Philadelphia and had shown the kind of society America could be. After 1752, when he carried out the famous kite experiment that showed lightning to be electricity, his scientific research took him to a plateau of celebrity completely new in the American colonies.

Yet his life had been very different from that of most of the other Founders. He was a "leather apron man," in the slang of his day, was proud of it, and never forgot it.

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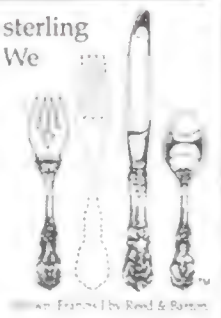

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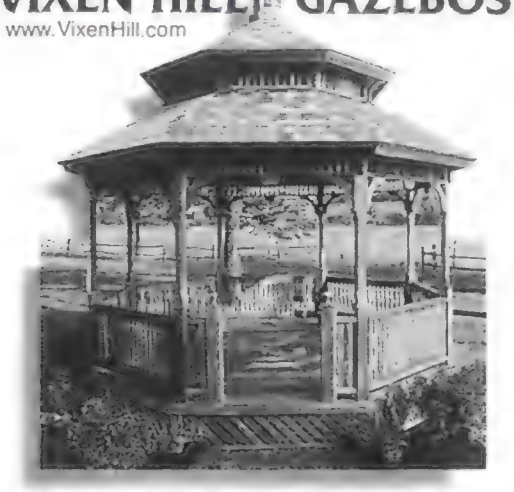

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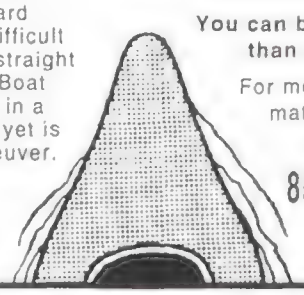

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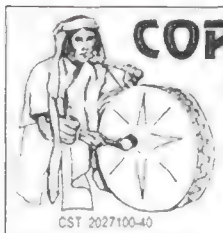

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Franklin was born January 17, 1706, in Boston. His father, Josiah Franklin, was nearly 50, a deeply religious Congregationalist and a soap and candle maker who had emigrated from the village of Ecton in the English midlands. His mother, Abiah Folger, was 38. Benjamin would be her eighth child. We know very little about her beyond Franklin's words in her epitaph. He called her a "discreet and virtuous woman."

Intending that Benjamin go into the ministry, his father sent him to Boston Latin School, where he excelled. But after a year his father withdrew him and sent him to a local schoolmaster who taught tradesmens' boys a little grammar, writing and mathematics so that they could help their masters when apprenticed. In his *Autobiography*, Franklin said that the decision was made "from a View of the Expence of a College Education which, having so large a Family, he could not well afford, and the mean Living many so educated were afterwards able to obtain. . . . "

At age 12 he went as an apprentice to older brother James, owner of a printing house, to learn the printing trade. ("Dr." Franklin would be created in middle age when he received an honorary doctorate from the University of St. Andrews in 1759, and one from Oxford in 1762.)

Had we encountered him during his time with James, we would have seen a stocky, energetic boy, attired in the deerskin breeches that, along with thick, blue wool knee stockings, long-sleeved speckled shirt and thick, well-greased shoes, made up the uniform of a printer's apprentice. He already had a taste for books, and James seems to have encouraged his reading. He had read Plutarch and Defoe. He seems also to have been familiar with Swift, Pope, Addison and Steele. During this time he was first exposed to the English philosopher John Locke's writings on personal freedom and the natural rights of man, concepts that would so deeply affect many of the Founders.

This printing press, believed to have been used by Franklin in London, is on display at the National Museum of American History.

He inherited his father's intense interest in the spiritual questions of life, but not his father's beliefs. He decided that while he was a Deist, he was not going to be a churchgoer. He began using the time people were at church to work on his reading and writing. However, he saw churches as the one institution, in a new world that had very few, that could support virtue, which he saw as critical to a citizen's inner growth and the creation of a civil society.

Franklin took easily to the patterns of science. He resolved to make his own life his first experiment. In 1722, at 16, not long before he left Boston, Franklin quite consciously changed his life. After reading *The Way to Health* by Thomas Tryon, he became a vegetarian for a while, began a regular exercise program and may have been the only man in Philadelphia who tried to bathe regularly. He also became concerned with ventilation, proper breathing and good air. (When he was 81, he told his friend Dr. Benjamin Rush that he had "never snuffed, chewed, or smoked.")

NATIONAL MUSEUM OF AMERICAN HISTORY, SI

These decisions flowed in part from the idea that respecting his body made him a better, more productive person. Better individuals made better citizens, and better citizens made for a more civil society. It was a view shaped by the Enlightenment's philosophers, who reasoned that the human species was infinitely perfectible.

To advance his knowledge, Franklin was willing to learn from anyone. Cotton Mather, the most influential Puritan in Massachusetts, was already famous for his involvement with the Salem witch trials when he published *Bonifacius: Essays to Do Good* in 1710. Its words had a profound effect on Franklin. "You must come forth to any Publick Service, whereof you may be capable, when you are call'd unto it. . . . That Fault of not Employing ones Parts for the Publick, One calls, 'A Great Sacriledge in the Temple of the God of Nature,'" wrote Mather. Three-quarters of a century later, having lived a life of public service, Franklin would write Mather's son, Samuel: "If I have been, as you seem to think, a useful citizen, the public owes the advantage of it to [your father's] book."

He even used Mather's book title as an inside joke to create the surname for his first literary alter ego, a fictional middle-aged widow named Silence Dogood. Her 14 letters, published in his brother's newspaper, the *Courant*, represent his first major public writing. By the time he had gotten to the eighth letter, published on July 2, 1722, the 16-year-old Franklin had gone beyond the gossipy humor with which he had begun the letters and embarked on what would become a lifelong working out of his philosophy in print: "WITHOUT Freedom of Thought," he wrote, "there can be no such Thing as Wisdom; and no such Thing as publick Liberty, without Freedom of Speech; which is the

In June 1752, Benjamin,with his son William, actually then 21, demonstrated that lightning is electricity—winning the elder Franklin international fame and scientific immortality.

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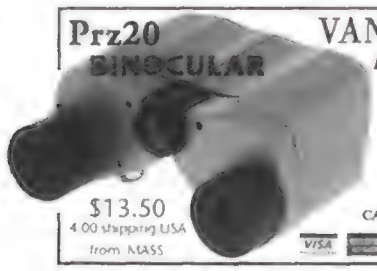

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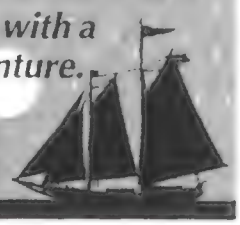

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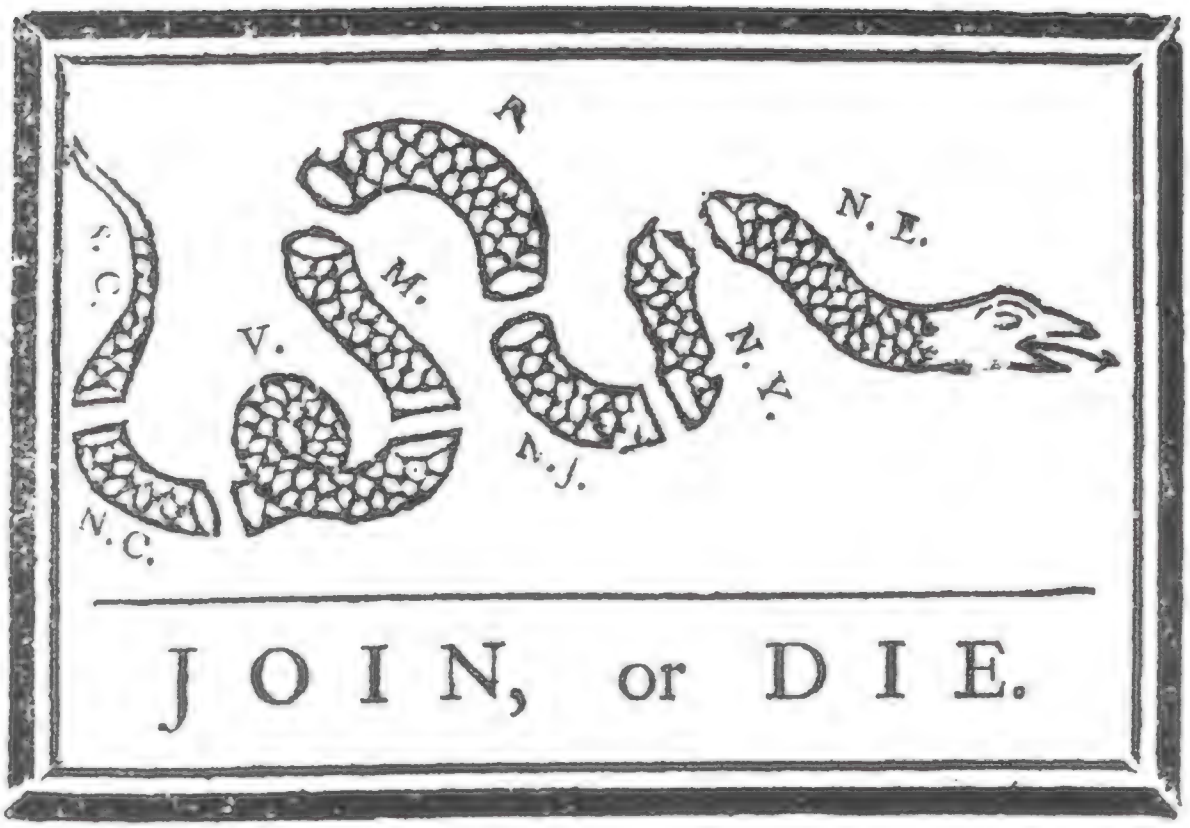

Learning of French encroachment down the Ohio River in 1754, Franklin published in his *Gazette* this cartoon—perhaps the first—urging the colonies to unite.

Right of every Man, as far as by it, he does not hurt or controul the Right of another: And this is the only Check it ought to suffer, and the only Bounds it ought to Know.

"This sacred Privilege is so essential to free Governments, that the Security of Property, and the Freedom of Speech always go together. . . . Whoever would overthrow the Liberty of a Nation, must begin by subduing the Freeness of Speech. . . . "

In 1727 he proposed to a group of friends in Philadelphia that they join together to start what he called the "Junto." It was his first experience with the power of small associations. To create opportunities, he used the junto model again and again, spinning off clones when a small group grew too large. The groups could become a loose network of independent societies. The plan was particularly effective in the creation of fire companies, but he started a city watch and libraries with it as well.

At 22 he compiled a list of "virtues." He ranked his list according to how hard he thought it would be for him to attain each virtue, hardest last, and then set about working on them, one by one. The order is revealing. At the head of the list was Temperance; easy for a man who had already decided against excessive drinking or eating. Then: Silence, Order, Resolution, Frugality, Industry, Sincerity, Justice, Moderation, Cleanliness, Tranquility and, finally, the two really tough ones for him: Chastity and Humility.

In youth, biographer Carl Van Doren says, Franklin "went to women hungrily, secretly, and briefly." Before he entered into a marriage with Deborah Read Rogers, he fathered a child. The mother's identity was never known. Franklin acknowledged and reared the boy he named William.

Franklin was 24 when he and Deborah, a carpenter's daughter, were married by common law in September 1730. She was "a sturdy, handsome, high-coloured woman, untaught and sometimes turbulent, little interested in her husband's studies or speculations but devoted to him."

In 1732 a son, Francis, was born, only to die at age 4 from smallpox. Franklin would always mourn him. In 1743 a daughter, Sarah, known as Sally, was born; Franklin adored her.

There is no evidence that he was unfaithful to Deborah at any time in this period of their lives in Philadelphia, and he acknowledges in many places the debt he felt for all her sup-

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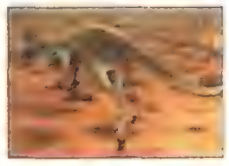

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port of him. She called him "Pappy."

Once Franklin began to travel for the post office, however, they were apart for months at a time. During these trips around the colonies, he may have had affairs with younger women, although with whom or how many, we do not know.

Franklin's contemporaries thought him sensual, and he had a reputation for sexual affairs. He certainly enjoyed sexual innuendo. When John Jay's wife was visiting with Franklin in Passy while Jay was in England working on the peace treaty negotiations, Franklin took three magnets, and indicating one as Jay, the other his wife, he showed how the two magnets were drawn to each another. But introducing the third, which he described as a certain English lady, he showed how her attraction could become the stronger. Both Jay and his wife were amused by the story.

Franklin never saw Deborah again after he sailed to England in 1764 to continue his service as Pennsylvania's colonial agent. She died, at 66, in 1774, while Franklin was in London wrestling with the final deterioration of the colonial relationship.

His struggle with humility, which he had placed last on his list of virtues, turned out much more successfully than his attempts at chastity. One of the central influences that helped him in this was Freemasonry. He first learned of this secret society as a poor, young journeyman printer working in London. When the Lodge of St. John, the first in the colonies, was formed in Philadelphia, in 1727, he was becoming a man of considerable substance, master of a printing house and publisher of the *Pennsylvania Gazette*, which he had purchased in 1729. He was inducted into the society in 1731.

Once inside the brotherhood, Franklin discovered it almost exactly mirrored his own beliefs. Its ascending degrees, like his list of virtues, were designed to help a man build a

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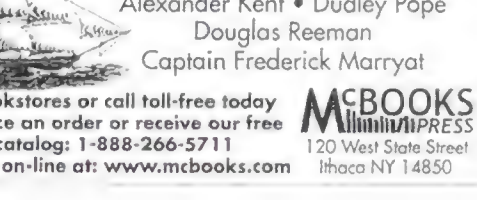

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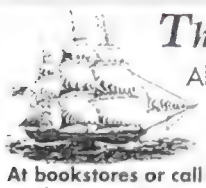

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In 1776 Benjamin Franklin was appointed with Thomas Jefferson, John Adams, Roger Sherman and Robert B. Livingston to draft the Declaration of Independence from Britain.

life that was "four square and true" through hard work and fair dealing.

Had we visited him at that time, working in his printing house on Market Street in Philadelphia, we would have seen a prospering tradesman with both the charm and toughness of a self-made entrepreneur, proud, brilliant, a little aggressive, a bit too self-promoting, but endlessly well-intentioned and hardworking. And everyone agreed he had a presence about him. He seemed bigger than his five foot nine or ten. Although he sometimes spoke hesitantly, his voice was pleasant, and he was already using the disarming flow of humorous stories and snatches of songs that marked the conversation of his later years. Once committed, he was decisive and tenacious.

On May 14, 1743, Franklin began work on his ultimate junto, the American Philosophical Society, which was modeled on the Royal Society, the leading intellectual association in Britain. We think of Franklin today principally for his experiments in electricity, particularly the indelible images of him flying a kite in a storm, but Franklin's contributions ranged across disciplines from climatology to oceanography to geology to medicine to what today we would call physics. By inviting the leading colonial natural scientists to join him in forming America's premiere intellectual society, he was exercising yet another variation

of his small-group model. As Masonry fed his spirit, so the American Philosophical Society and his memberships in the Royal Society (1756) and the French Academy of Science (1772) would come to feed his mind.

Back from his long embassy in France, in 1787 he was selected to be one of Pennsylvania's delegates to the Constitutional Convention. Immediately upon arriving in Philadelphia for the convention, George Washington paid an official call on Franklin, the only other man of comparable stature in the country.

Franklin was the oldest man at the Constitutional Convention, as he had been the oldest man in the Continental Congress in 1775. William Pierce of Georgia later wrote, "Dr. Franklin is well known to be the greatest phylosopher of the present age. . . . he does not shine much in Public Council,—he is no Speaker, nor does he seem to let politics engage his attention. He is, however, a most extraordinary Man, and tells a story in a style more engaging than anything I ever heard. . . . He is 82 years old, and possesses an activity of mind equal to a youth of 25 years of age."

At the convention, Washington and Franklin acted as moderating forces. Washington spoke but once in formal sessions, and Franklin only infrequently. But each, in his own way, worked to see that the convention did not fly apart as the passionate debate over the nation's form of government went on.

One Friday afternoon, on the 13th of July 1787, during a break in the deliberations of the Constitutional Convention, lobbyist Manasseh Cutler called upon Franklin at his home on Market Street. Thanks to that visit we have a final word portrait of one of our history's most extraordinary figures. He was, said Cutler, "a short, fat, trunched old man, in a plain Quaker dress, bald pate, and short white locks, sitting without his hat under the tree. . . . His manners were

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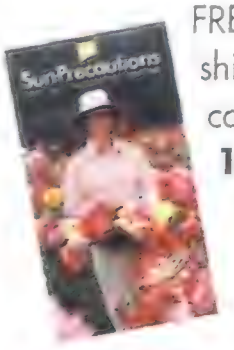

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At the signing of the Declaration of Independence, Franklin reputedly said, "We must, indeed, all hang together, or most assuredly we shall all hang separately."

perfectly easy, and everything about him seems to diffuse an unrestrained freedom and happiness. He has an incessant vein of humor, accompanied with an uncommon vivacity, which seems as natural and involuntary as his breathing."

Two years later, in 1789, Franklin's health was failing. With wisdom's long vision, he decided to amend his will. He stated his goal candidly: "I wish to be useful even after my Death, if possible, in forming and advancing other young men that may be serviceable to their Country. . . . "

He gave to Boston and Philadelphia each "One thousand Pounds Sterling." This money was to be loaned in small sums to "young married Artificers, under the Age of twenty-five Years, as have served an Apprenticeship in the said Town; and faithfully fulfilled the Duties required in their Indentures, so as to obtain a good moral Character from at least two respectable Citizens. . . . " Franklin clearly saw each set of three people—a young "Artificer" and two "respectable Citizens"—forming a small group. In this way individuals would join in small groups, strengthening their cities, their states and, ultimately, their nation.

The trusts would live on until dissolved in 1991, still in accordance with Franklin's careful instructions. For 200 years they improved the lives of thousands of young families in Boston and Philadelphia, and they do so still, because the $6.5 million in the trusts when they were dissolved was used to support educational programs for the same people Franklin had originally designed them to serve. His trusts anticipated the modern microlending programs of the famous Grameen Bank and similar efforts, which have had an empowering effect in many of today's nations.

By the fall of 1789 there was a sense that Franklin was dying, and people great and small began to say goodbye. One of the most moving farewells is in a letter Washington wrote. It says a lot about these two men who had grown old in their country's service, in the process forging a remarkable relationship, in spite of their very significant differences. The letter ends:

"If to be venerated for benevolence—If to be admired for talent—if to be esteemed for patriotism—if to be beloved for philanthropy, can gratify the human mind, you must have the pleasing consolation to know that you have not lived in vain; And I flatter myself that it will not be ranked among the least grateful occurrences of your life to be assured that so long

as I retain my memory—you will be thought on with respect, veneration and Affection by Your sincere friend

George Washington"

Franklin's last great effort was dedicated to eliminating slavery from his new country. He had owned slaves, advertised their sale in his newspaper and even traded in human beings. But by 1751 he had begun to think the institution was philosophically and economically unsound. In 1787 he helped reinvigorate the Pennsylvania Society for Promoting the Abolition of Slavery, the first such society in America, by becoming its president.

When he wrote his will at the end of a life filled with honors and celebrity, he defined himself as: "I, Benjamin Franklin, of Philadelphia, printer, late Minister Plenipotentiary from the United States of America to the Court of France, now President of the State of Pennsylvania. . . ."

Franklin died about 11 o'clock Saturday night on April 17, 1790, three months past his 84th birthday. His was the largest funeral that had ever been held in America. It was estimated that 20,000 people witnessed the procession and ceremony.

On April 22, James Madison moved that the House of Representatives wear mourning for a month. It passed unanimously without discussion. The Senate, though, would not agree. Jefferson took the matter to Washington, who rejected it, asking, if the practice were once begun, where the line would be drawn. "I told him," Jefferson later wrote, "that the world had drawn so broad a line between him and Dr. Franklin, on the one side, and the residue of mankind, on the other, that we might wear mourning for them, and the question still remain new and undecided as to all others." It is an appraisal two centuries of hindsight has only strengthened.

Virginia-based writer Stephan A. Schwartz is working on a biography of George Mason.

FRANKLIN'S APHORISMS

A selection from his *Poor Richard's Almanack. (Note: The proverbs in the* Almanack *were not all Franklin's own. He borrowed freely from "the wisdom of many ages and nations.")*

"Genius without Education is like Silver in the Mine."

"Having been poor is no shame, but being ashamed of it, is."

"Love your Enemies, for they tell you your Faults."

"He's a Fool that makes his Doctor his Heir."

"Early to bed and early to rise, makes a man healthy, wealthy and wise."

"He that waits upon Fortune, is never sure of a Dinner."

"To serve the Publick faithfully, and at the same time please it entirely, is impracticable."

"Keep your eyes wide open before marriage, half shut afterwards."

"Search others for their virtues, thy self for thy vices."

"Kings and Bears often worry their Keepers."

"When the Well's dry, we know the Worth of Water."

"Little Strokes, Fell great Oaks."

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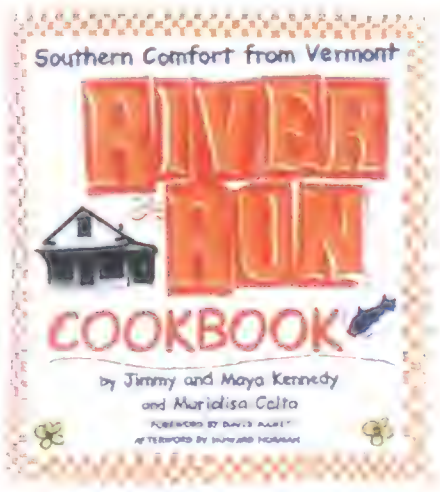
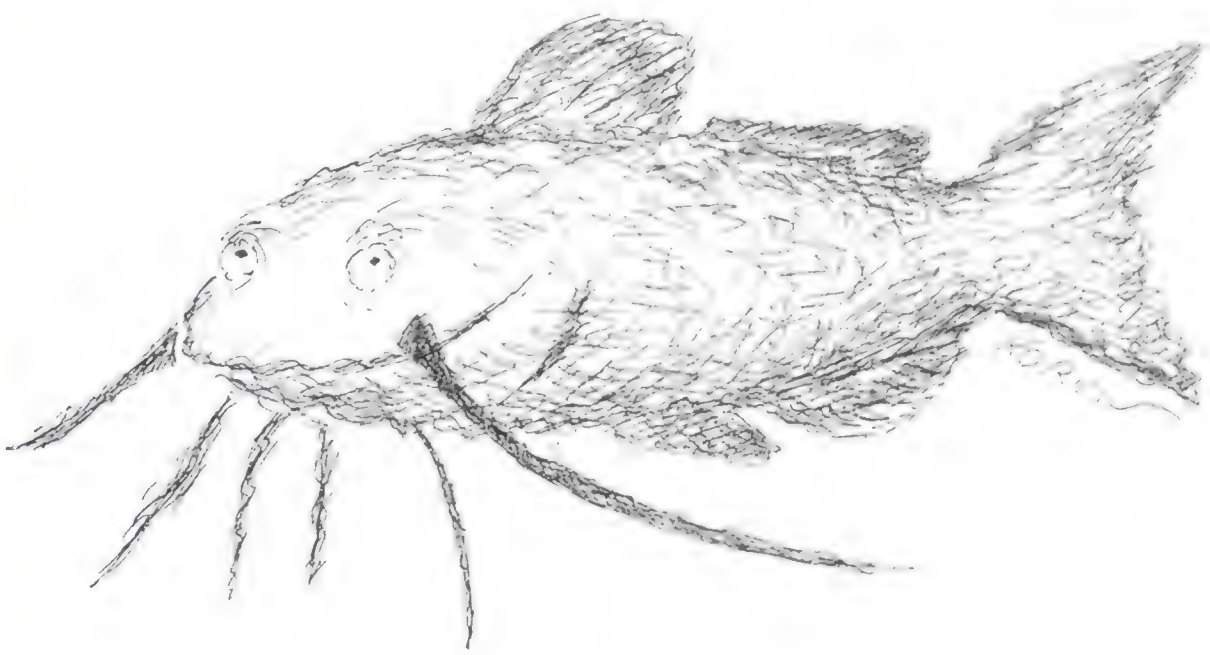


River Run Cookbook:
Southern Comfort from Vermont
by Jimmy and Maya Kennedy
and Marialisa Calta
Foreword by David Mamet;
Afterword by Howard Norman

HarperCollins, $35

THE TITLE TO THE CONTRARY, *RIVER Run* is, as it turns out, a good deal more than a cookbook. Recipes abound, sure enough; open the pages and you'll discover a trove of no-nonsense, dependably lucid instructions that will result in ambrosial pancakes, really amazing coleslaw or authentic jambalaya. (Quiet reassurances underlie all directions: the reader is informed, for instance, that aspiring barbecue chefs can, in a pinch, "forget the smoking and just use your oven. Purists will disagree, but you can make BBQ to be proud of right in your own kitchen.")

With restaurateurs Jimmy and Maya Kennedy and writer Marialisa Calta as your guides, armchair travelers can pull right up to a little white-frame cottage, home to the River Run Restaurant, and wade into the life of a rural New England village (Plainfield, Vermont, population 1,300). Plainfield is long on quirky charm; the town's unexpected diversity is reflected every day in the folks who show up to eat the kind of memorable, homemade food that is fast disappearing from our own family fare. On any morning of the week, one might rub elbows, literally—there are only 24 tables and people need to share space—with an Argentine-born puppeteer, a carpenter, a baker, the high school soccer coach, a piano tuner, a couple of farmers, several members of the volunteer fire department, an artist. A handful of Goddard College students. And the occasional celebrity—playwright David Mamet, *New Yorker* cartoonist Ed Koren, novelist Howard Norman. That's just for starters. "River Run," write the Kennedys, "is not only a restaurant but a gather-



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ing place for friends and neighbors."

Given that good-natured approach to day-to-day existence, it's only natural that this cookbook also offers the transcript of a page from the town constable's log: "1 P.M. Receive call from Betty Caruso, live animal in feedbag on Lower Road. Investigate. Long-haired black cat in bag. Escapes into woods. Notify neighbors." Or an homage to the town barber, Bill, whose shop was located for years in the building now occupied by River Run. Or a discourse on farmer Bill Smith's traditional maple sugaring operation, accompanied by a sixth grader's "Mud-Season Poem": "You might get stuck/In the gluck/Unless you have a 4WD truck." Or a recipe contributed by David Mamet (his offering, predictably, relies on one part machismo, one part grit, invoking burnt toast and the exertions of the volunteer fire department).

There's an undeniable North meets South exuberance to the River Run cuisine, reflecting the restaurant's roots. Jimmy Kennedy grew up learning his way around the kitchen from his mom in Brewer, Mississippi (hence the variations on the theme of catfish), and his wife, Maya, in Plainfield (that's how the maple syrup made it into the marinade). No doubt readers are going to hurtle toward their kitchens, wanting to whip up the dishes—soups and stews, griddle cakes and fritters, salads and side dishes, desserts and more—chronicled in mouthwatering detail here.

But in the end, it's really as much about friends as about food. The pictures tell the story: rather than a succession of images trumpeting glossy, Martha Stewart-stylized entrées, one discovers black-and-white photographs, affectionate portraits all, of the people who cook, and eat and while away the hours, at the River Run home-away-from-home.

Kathleen Burke is a Board Editor and the book review editor of SMITHSONIAN.

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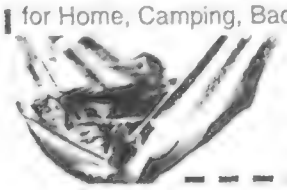

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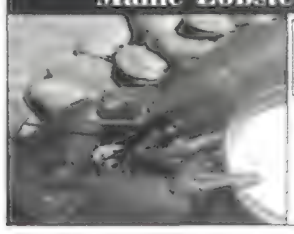
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Japan Journey, October 24–November 11. Discover Kyoto, Kurashiki, and Tokyo.

Patagonia, November 12–23. Sail through the Chilean archipelago on the *Terra Australis* and hike in Torres del Paine National Park.

Christmas in Dublin, December 20–27. Includes a festive private tour of Georgian Dublin.

Exploring Antarctica, South Georgia, & the Falkland Islands, January 13–February 3. Aboard the luxurious expedition vessel *Hanseatic*.

U.S. and Canada Tours

Mackinac Island, August 23–26. Discover the fascinating history of the island and stay at the Grand Hotel.

Toronto Film Festival, September 6–11. Special passes offer premiere screenings and sessions with Festival staff, film historians, and critics.

Chicago by Streamliner, September 20–23. Enjoy a weekend rail journey from Washington, DC.

North Carolina Arts & Crafts, September 26–30. Explore Asheville's flourishing arts and crafts community.

Nova Scotia: Autumn Adventure, October 6–12. Experience kayaking, hiking, rafting and whale-watching during the height of fall color.

Voyage on the Columbia and Snake Rivers, October 6–13. Follow the route of Lewis and Clark aboard the *Sea Lion*.

Hudson Valley Art, October 12–19. Visit artists' studios and private art collections.

Breakup of the Confederacy: Jefferson Davis' Flight from Richmond, October 31–November 6. Led by renowned historian Edwin C. Bearss.

Florida Manatees, November 3–17. Learn about conservation and ecology while swimming with the gentle manatees.

Odyssey Tours

Moderately priced tours with multiple departure dates. Call 1-800-932-8287 for information.

British Isles and Beyond: A Voyage of Viking and Celtic Traditions, August 13–29. Aboard the luxury cruise ship *Saga Rose*.

Sojourn on Cote D'Azur: A One-Week Stay in Cannes, September and November. Experience this sophisticated coastal town and its dazzling art and culture.

Sojourn in Greece: A 10-Night Stay in Coastal Vouliagmeni, November, February, and April. Discover Greek history and culture and enjoy this refined seaside town just outside Athens.

The National Parks: America's Treasures, September. Includes Mesa Verde, Grand Canyon, and Yellowstone.

South American Voyage: A Cruise from Brazil to Chile, January 16–February 3. Aboard the luxury cruise ship *Saga Rose*.

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THE LAST PAGE

No Place Like Home

BY JOHN THOMPSON

I WRITE GUIDEBOOKS FOR A LIVing. Mostly it's a great job. But an unusual occupational hazard revealed itself to me recently when I rolled into my driveway after several weeks on the road and instinctively reached for my notebook. This is what I wrote:

The Thompson Residence (*Weekends, 9 A.M. - 6 P.M., or by reservation.*) Dating from the early 1950s, this one-story ranch house is where the writer and his family lived for many more years than they ever intended. Furnishings include the original plastic lawn chairs and a complete set of *Barney the Dinosaur: the Early Years* tapes. On the living room bookshelf, a fine example of early 1980s IKEA fiberboard assembled by the writer, are such titles as *David Copperfield* and *The I That Is We: Awakening to Higher Energies through Unconditional Love.*

A comforting disarray gives an authentic sense of the home life of a writer who was seldom at home. Stacks of mail stand heaped on kitchen counters; a cola stain on the linoleum floor has been preserved to mark the first time the writer's daughter poured her own drink; pencil lines on one wall record the children's height at various ages. Adjacent drawings attest to their artistic evolution from abstract to primitive to naughty-as-I-want-to-be.

Reenactors dressed in period costumes portray the writer's family. The "writer's wife" greets you at the door with a semi-warm smile. A cheerful "I'm so glad you're here" sounds a note of welcome while reminding you that you are a visitor. The "son" and "daughter" offer anecdotal tours of the premises.

Thompson's Yard (*Daily, 7 A.M. - 7 P.M.*) This junglelike expanse of native flora brings to mind the naturalist landscape ideas of the 18th century. Flowing seamlessly from one area to the next, the garden displays a healthy mix of grasses, buttercups and dandelions, creating a devil-may-care appearance in an otherwise very proper neighborhood. Notice how a patch of *Digitaria sanguinalis* (crabgrass) near the spigot is laced with a free-flowing yellow pattern oddly reminiscent of the loops and spirals of a garden hose.

Olde Home Place Restaurant (*Open daily for all meals, except when the cook doesn't feel like it.*) This cozy dining room offers home-cooked meals with an attitude. On any given night, the ambience can vary suddenly from flowers and candlelight to Pokémon cards and overturned sippy cups. The menu of several microwave specialties relieves you of the tedium of too many options. In the mood for fresh fish? Bring it and the chef will cook it. You want green beans? Open the can yourself.

Stay Awhile B&B (*Phone ahead.*) You'll feel right at home in one of three quaint bedrooms. Family photographs and stacks of mail-order catalogs provide a homey touch. Before tucking in for the night, check out the lifelike collection of dust sculptures beneath the furniture. To warm the bed, the genial hostess actually gets in with you. Bountiful breakfasts consist of Cheerios. After two weeks here you'll wonder why you ever dreamed of staying anywhere else.

WALLY NEIBART

19,500 ACRES IS A LOT OF OPEN SPACE.

ESPECIALLY WHEN YOUR STRIDE IS ONLY TWO INCHES LONG.

The Greater Prairie Chicken is one of several species to benefit from the latest conservation effort by Phillips Petroleum. Together with the National Fish and Wildlife Foundation, Phillips will help restore and manage 19,500 acres in northwestern Missouri, making it a safe haven for high-priority birds. Now breeding populations of Greater Prairie Chickens, Henslow's Sparrows and Bobolinks will have an improved chance of survival. And the finished project will become the first of many bird conservation areas to eventually span the country. It's just one more way Phillips works to improve our world and why we're known as The Performance Company.

PHILLIPS PETROLEUM COMPANY

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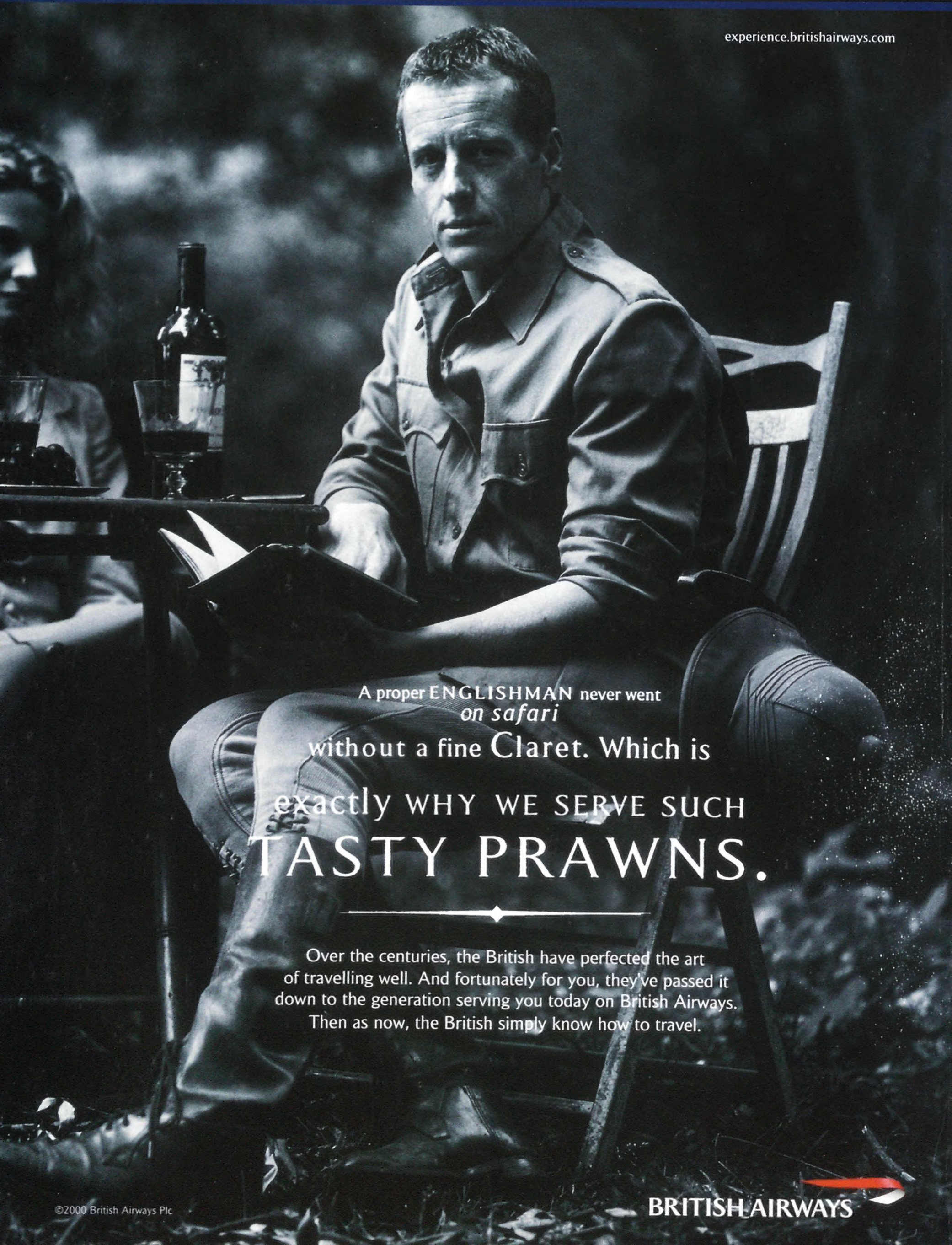
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